*Next Meeting, The American Association of Orthodontists, San Francisco, California, May 8 through 12, 1955. Headquarters, The Fairmont Hotel.*

# AMERICAN JOURNAL OF ORTHODONTICS

OFFICIAL PUBLICATION OF
THE AMERICAN ASSOCIATION OF ORTHODONTISTS,
ITS COMPONENT SOCIETIES, AND
THE AMERICAN BOARD OF ORTHODONTICS

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Vol. 41 FEBRUARY, 1955 No. 2

# Whatever Your Needs. . .

**1** Williams Round Buccal Tubes — for .036" or .040" diam. wire.

**2** Williams No. 2 Arch Wire — for labial or lingual arches. Round (.036" to .040" diam.) or rectangular (.022" x .028").*

**3** Williams No. 1 Ortho Wire — for intermaxillary hooks, adjustable spring stops, etc. (.020", .022", .036" or .040" diam. wire).*

**4** Williams Anterior Bands — anatomically contoured — 18 graduated sizes, .004" x .160" wide.

**5** Williams Open Bracket Tubes — for .032", .036", or .040" diam. wire.

**6** Williams Stainless Steel Ligature Wire — .012" diam.

**7** Williams Lok-Tite Wire — high bend test rating — .028" and .030" gages.

**8** Williams Mershon Tubes and Posts — extra bearing surface for greater stability to lingual arch. (Also round and half-round tubes.*)

**9** Williams Seamless Molar Bands — plain or contoured — 24 graduated sizes, .007" thick x .180" wide.

**10** Williams Adjustaloop Contoured Bands — precise anatomical conformity — .036" to .485" diams.

**11** Williams No. 1 Ortho Spring Wire — for stabilizers, auxiliary springs, etc. — .020" or .022" diam.*

**12** Williams Arch Repair Tubes — slotted for quick, simple mending. In 4 sizes.

**13** Williams Band Material — gages .009" to .003", widths .12" to .25".*

**X** Williams Ortho Wire Solder — gages .020" and .012" known for its ease of flow, strength, and absence of pitting.

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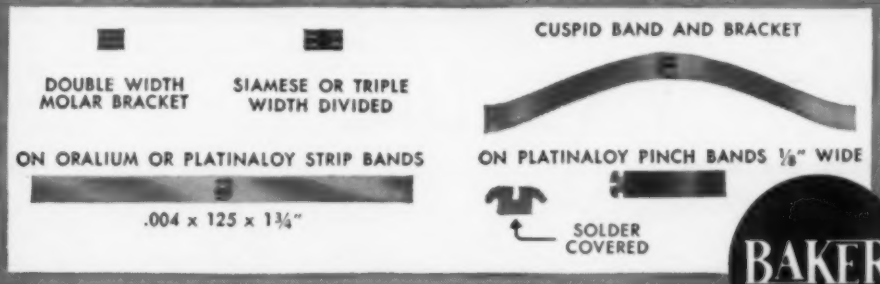
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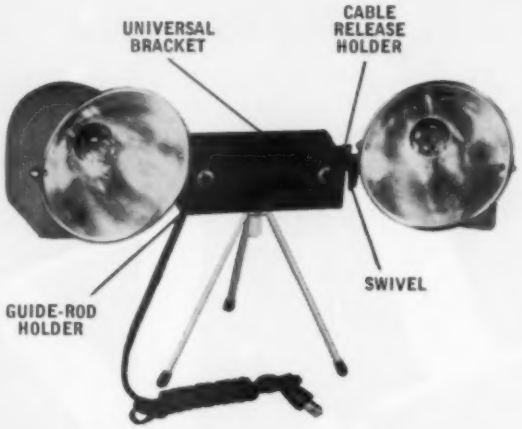
# The ORTHOTRON

## Twin Flash Electronic

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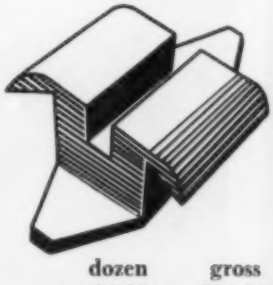

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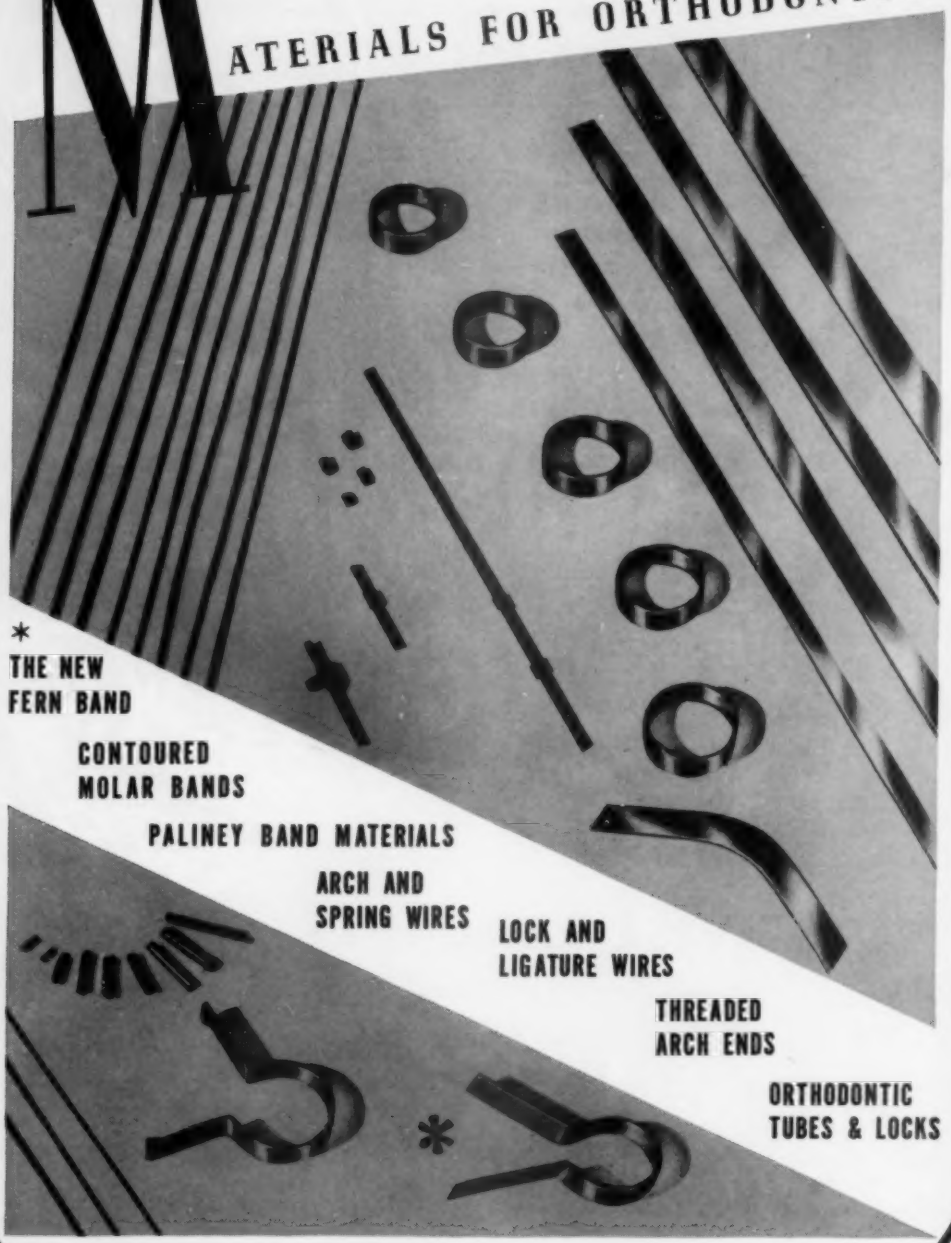


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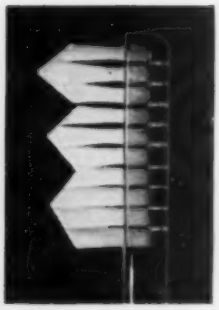

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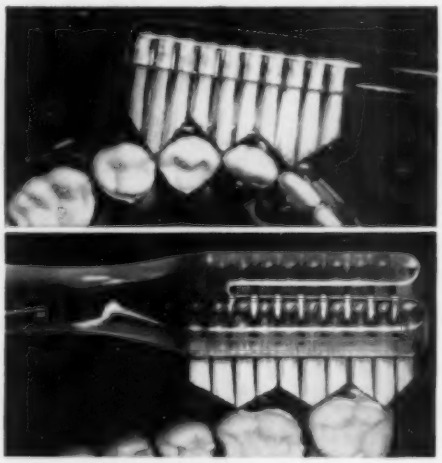

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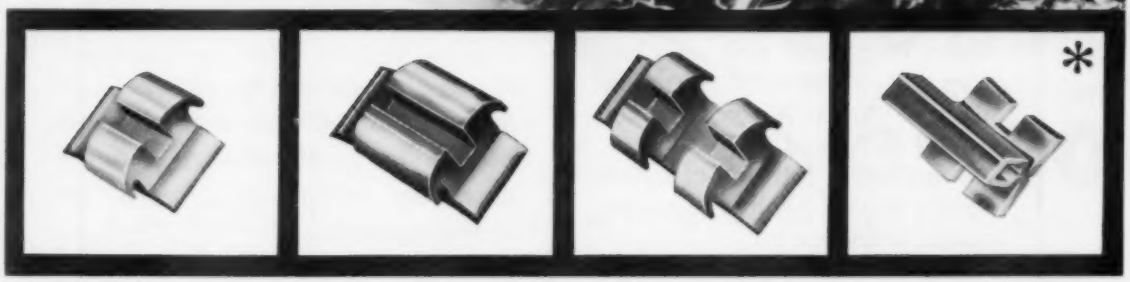

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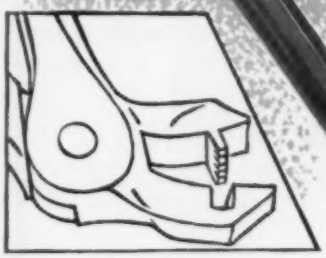

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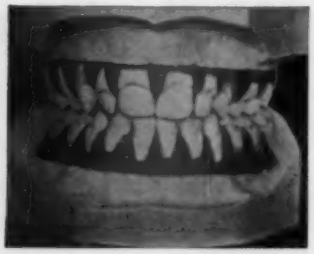

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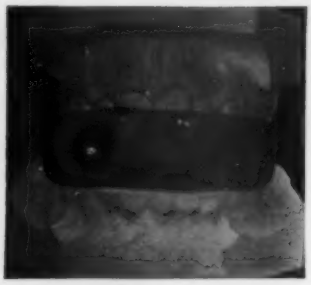

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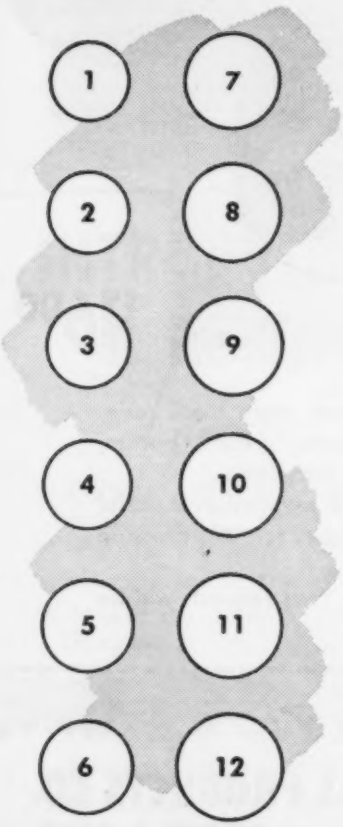


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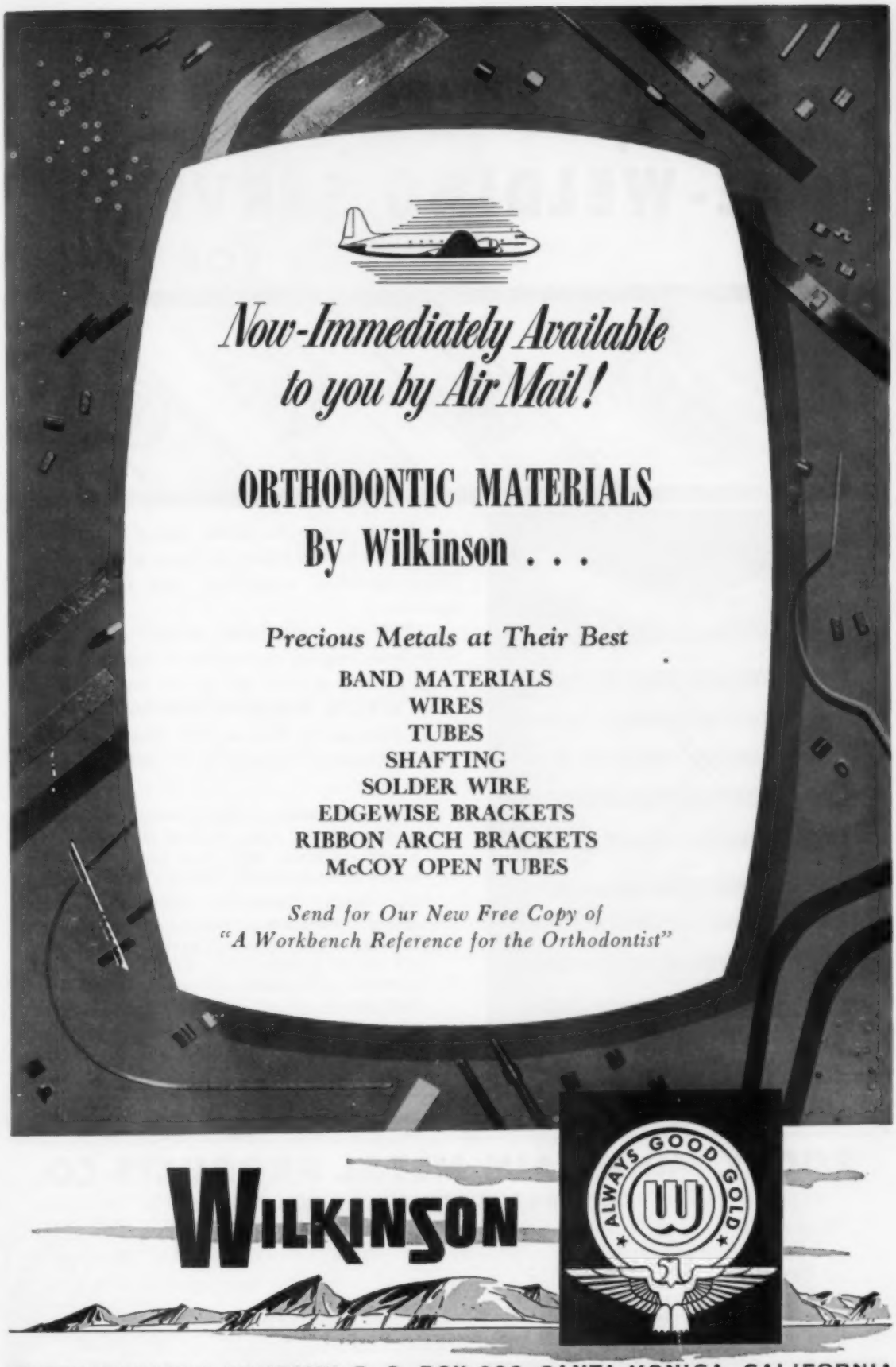

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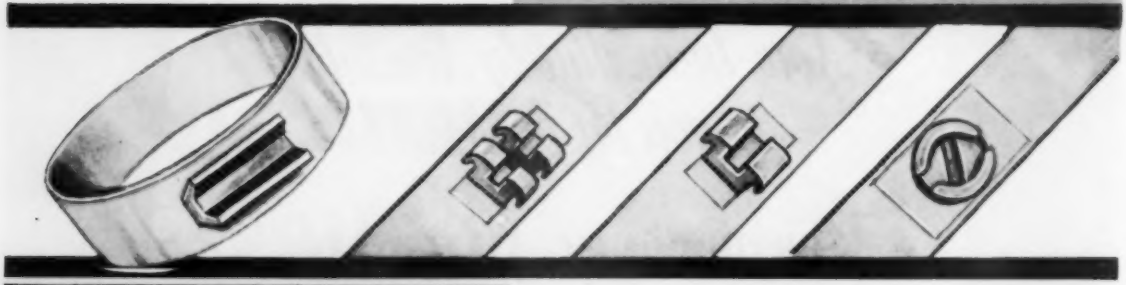

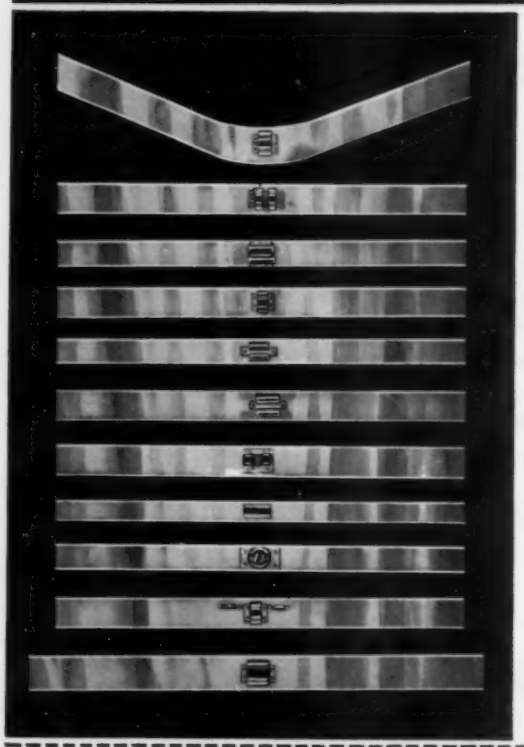

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# Original Articles

## PRESIDENT'S ADDRESS, SOUTHERN SOCIETY OF ORTHODONTISTS

LEIGH C. FAIRBANK, D.D.S., SC.D., WASHINGTON, D. C.

IN ACCORDANCE with prescribed direction and traditional custom, it is my duty to address our Society before relinquishing the office of president. The recommendations submitted herewith touch briefly some observations of importance to orthodontics and this Society. They are presented for your serious consideration.

The growth of our Society during the last few years is most gratifying. Each year there has been an increasing number of applications for membership. Our Membership Committee has the stupendous task, over a period of many months, of reviewing these applications. This requires considerable correspondence and frequent long-distance telephone communication. Strict adherence to eligibility requirements as provided in our own constitution, as well as that of the American Association of Orthodontists, must always be the basis upon which approval or disapproval of every application is made. This final decision is not easily made. Only by checking and rechecking the records and activities of each applicant can the proper action finally be taken.

For the first time in the history of our Society, it is mandatory this year for each applicant to appear before the Membership Committee in person. This decision permits the committee to make a personal appraisal of each applicant, to question each person, and to estimate the quality, purposes, and professional demeanor of each. The committee has every desire to recommend

Presented before the thirty-third annual meeting of the Southern Society of Orthodontists, Mayflower Hotel, Washington, D. C., Nov. 1, 1954.

qualified men who will be regular participants in the activities of the Southern Society of Orthodontists. Membership in our Society carries certain responsibilities for new members. We are not interested in men who are members in name only—we want members who will be active in Society work or who always attend the annual meetings. On the other hand, our members should manifest a hearty welcome to our new members. We should be interested in their beginning as co-workers in our area. May our interest in them always be helpful, encouraging, and inspiring. In this way our Society will be a factor in their progress and an important influence in their entire careers. The Society will be of increasing value to them and, in turn, they will become assets to the Society.

Many important problems have come before our Society nearly every year. These have been presented to us by authorized individuals representing our parent body, the American Association of Orthodontists. This year is no exception, and we are most fortunate in having Dr. Frederick T. West, president of the A.A.O., with us at this meeting. He will bring an important message to us.

At this time, on the occasion of the thirty-third annual meeting of the Southern Society of Orthodontists, we might well reflect upon the growth of our Society and its accomplishments. The older members can recall the small beginning. The years have brought many changes, adding tremendously to its membership, its prestige, and its influence. Above all, through the work of this growing society, there has developed in this territory a greatly improved and widespread professional service which has improved the health and happiness of thousands of patients.

During this long period of service our members have experienced many changes in our special field. Many of our members may be characterized as seekers after the truth. The progressive developments which have come through researches and careful clinical experiments have been widely applied in practice. Our membership is typically progressive. Our essayists, year after year, have influenced the daily routine of a majority of our members.

Those of us who have had twenty-five and more years of clinical experience look back on our years of training and experience in much the same way a motorist looks in the little rearview mirror of his car. A hurried glimpse of the road behind always indicates when one can move forward safely. Yes, the wise and experienced clinician depends upon past experiences as he moves forward in the newer developments of our specialty. Past experience can be a guidepost, but it must not be a hitching post! The great advance in orthodontic education, the highest professional standing of our societies, and our greatest service to the public will come when we finally establish a training program in which the guideposts of the past are woven into the pattern with research findings and the various techniques that have proved successful through the years.

This meeting should be helpful to all. Our committees have labored long and diligently. My grateful appreciation goes to each and every one. The Executive Committee has a tremendous responsibility. The welfare of the

Society is dependent upon them. The Program Committee has secured an excellent group of essayists and clinicians, as well as an interesting forum and panel discussion. This committee and the secretary made a special trip to Washington early in the year for the careful development of the program. I am most grateful to them for their unusual efforts and the expenditure of time and money for this express purpose.

Special acknowledgment of the untiring efforts of our efficient secretary, Duke Edwards, is imperative. Commendation of his unusual work and results then becomes an integral part of the records of the Society. We must all understand that the secretary of any organization has more control over the many administrative functions than any other officer. Also, the demanding requests of other officers add to his labor. As an added function of his office, the *News Letter* has become a valuable feature to the Society, demanding many extra hours of labor. His responsibilities have been carried out with such accuracy and efficiency that I wish to commend him here and now for his devotion to this big task and the cheerful manner in which he has carried out every duty. At the same time I wish to thank Mrs. Edwards for her pen-and-ink illustrations in the *News Letters* and to Dr. Edwards' office personnel for extra hours spent on behalf of our Society. We owe much to Duke Edwards. On behalf of the officers and members of our Society, I wish to express our thanks and appreciation for his splendid work.

The Local Arrangements Committee, under the able leadership of Dr. William Curtis, has provided all the essentials for a smoothly running convention. All of us are deeply appreciative to Bill Curtis, Eddie Rice, and Bill Van Deusen, and to those Washington orthodontists, members of the Middle Atlantic Society, who have assisted.

The provisions for the social program and excellent entertainment for the ladies have been limited only by demands and responsibilities that were imperative and took precedence over our group. However, I sincerely hope this will be a happy and memorable visit to our capital city for all of you.

It has been a privilege to serve as your president. I have experienced much that will long be remembered. It is natural for me to expect the officers and directors to work with me as a well-trained staff. My long years of military service established habits of staff routine that have become as natural as breathing! Our constitution and by-laws specify all the duties of each officer and the responsibilities of each director in the preparation for the annual meeting. There is tremendous inner satisfaction when there is a sense of partnership, unanimous desire for accomplishment, and knowledge of work well and honestly done. This is their program. If the record of some worthy achievement, a single helpful sign of progress, or a suggestion of tangible worth accrues for the benefit of this Society and its members, I shall be forever grateful for this opportunity to have served you in a small way as your president.

1726 Eye St., N. W.

# THE BASIC ELEMENTS OF LIVING

GEORGE D. HEATON, D.D.,* CHARLOTTE, N. C.

I DON'T know when in my speaking experience I have ever been so graciously invited, nor so cordially and thoroughly briefed as to the nature of the meeting, as upon this occasion when Dr. Fairbank was so kind as not only to extend the invitation, but to indicate to me something of the nature of the gathering so that one would feel he had a purpose other than the purpose of entertainment. And not only because of that superior kindness and thoughtfulness with which he expressed himself, but also because of the friends that I have among the orthodontists who are here, and particularly the orthodontists from Charlotte, and our personal indebtedness to one orthodontist in particular—an indebtedness that we are still paying, incidentally, but we will finally get it off.

I just want you to know that I am very, very happy to be here. I only wish that I might in some way measure up to so gracious an introduction. I suppose I really ought to take the advice that Dorothy Dix gave an old maid down in Florida. This old maid wrote her and said, "My dear Miss Dix: I'm an old maid who has received her first proposal for marriage, but I have false teeth. Should I tell the man the truth and lose perhaps the only chance I'll ever have to become married or should I marry him and deceive him?" Miss Dix replied, "Marry him and keep your mouth shut." I think that would be excellent advice under these circumstances. As I left home this afternoon, Mrs. Heaton said to me, "Now don't you think it's a little presumptuous for you to go up there and speak to an opening session of the Southern Society of Orthodontists? Is there nothing that you will not attempt? It's so completely out of your field." And I said, "Well, Babe, I've picked up a few ideas as I've gone around and I think I'll have to justify my presence by my watermelon story."

It was about three years ago at the Southern Baptist Convention in Chicago. Now up to this time we had gone as far north as Washington, as you have come for your meeting. But why Southern Baptists ever met in Chicago, only a Southern Baptist could ever figure out. We were quartered in the Stevens Hotel, as it was then known (the biggest hotel in the world), and I shall never forget the occasion. At the same time our convention was meeting, there was a convention of traveling salesmen going on in the same hotel. They represented the grain industry—they sold wheat, corn, rye, barely, and brought along a few wild oats for samples. One night in a dining room almost as lovely as this

After-dinner address delivered before the Southern Society of Orthodontists in Washington, D. C., Oct. 31, 1954.

*Pastor of Myers Park Baptist Church, Charlotte, North Carolina.

a banquet was being given for the clergymen, and in a dining room right adjacent to it a banquet was being given for these traveling salesmen. According to the same type of statement that Dr. Curtis presented to you, the banquet for the traveling salesmen was not to be an altogether dry affair, so the chef at the Stevens Hotel had prepared as dessert for the salesmen Georgia watermelon that was spiked with Kentucky bourbon whisky, and the dessert for the preachers was, of course, ice cream and cake. But somehow the headwaiter got the thing mixed up and he brought this watermelon in for the clergymen and it gave off an aroma that the clergy had never before associated with watermelon. When the headwaiter went into the kitchen the chef discovered his mistake and he sent the headwaiter back to retrieve this watermelon so he could get it over to the traveling salesmen. The headwaiter came back shaking his head and saying, "It's too late. Those preachers are already eating that watermelon." The chef said, "What are they saying?" And the headwaiter replied, "Hell, they aren't saying a thing, they're just putting the seeds in their pockets." Well, I've picked up a few seeds as I've gone around, and maybe even the Southern Society of Orthodontists might be good fertile soil in which to sow them.

I do want tonight, with some mixture of levity, to speak concerning your profession, though it might seem presumptuous. I cannot help but say to any group of professional people, particularly at this time in the history of humankind when life is so cheap, that the sanctity of human personality is so great that no individual dares put his hand to the destiny of a human being but that he puts his hand there with the understanding of the sacredness of what is at stake. There is that sanctity of human life and you gentlemen, professionally, are among those who, day after day, by what you do and what you are, alter very profoundly the destiny of human beings. It is of that thing that I will speak to you tonight because it is inherent in your own profession: namely, no man ever practices orthodontics but that he understands the stupidity of ever attempting to compartmentalize a human being. If ever there was a group which had vividly portrayed for them the impact of the physical upon the mental and emotional well-being of personality, it is your profession. Perhaps some of you made vocational commitments in this field because you have witnessed that drama of the change of attitude toward life because of alterations that came through the physical medium of expression. I think that far earlier than the medical profession, you, in your particular field, were aware of the tremendous power of the physical over the mental and emotional well-being of an individual. And because you have been so aware of this, I think perhaps you have stood earlier on that threshold of vistas that are yet to be explored, namely, the impact of the emotional and the mental upon the physical changes that take place in life. I am not sufficiently acquainted in your own particular field to be even conversant with the possibilities of biochemical changes related to your field that are directly traceable to emotional and mental attitudes; yet, one is profoundly aware that in the therapy of the medical profession there are emotional disturbances and instabilities which produce physical responses that vitally affect the destiny of humankind.

This is the threshold where we stand, and certainly every man in the field of orthodontics knows that not only is it true emotionally, but it is true likewise in certain mental attitudes. There are conditions which produce harmonious physical consequences and there are mental attitudes that produce unhealthy physical conditions. Upon this evidence of the impact of the psyche upon the body, a whole new literature in the practice of medicine is now before us. How it affects you in your own area, I do not know, in the terms of orthodontics, but there is one thing I know even more profoundly than any knowledge you may have in this field—that the most unfortunate of all the conditions that seem to prevail professionally, not only in medicine and dentistry but in the clergy and the other professional services as well, is that that which we know concerning others is so grossly neglected in terms of ourselves. I do not propose tonight to preach to you. I simply propose that it is not common sense for any professional man, be he minister, physician, or dentist, who knows the interrelatedness and integration of all the factors that make up the human being, to deal with these qualities in terms of the patient and to neglect them in terms of himself. The worst casualties professionally are not the casualties that result from those conditions which could not have been prevented because of certain chemical changes, but the worst casualties that come to us professionally are the disabilities and the diminishing of skills because we have lost sight of the truth about ourselves as we understood it in terms of others. It would just seem that we had better common sense.

There is a train that goes through Charlotte every morning. It's train No. 36 coming up north and, typical of some of the Southern trains, a rather long journey if you board it in Charlotte and head north. Some of us, of course, always get on the dining car for breakfast, and the other morning I had a rather unusual experience. Sitting across from me in the dining car were two gentlemen who were engaged in a very fascinating conversation. It turned out that one of them was a professor from the University of Alabama and the other was just a plain old Georgia dirt farmer. I heard this university professor say to the dirt farmer, "It's going to be a long ride from here to Washington. We ought to get in some kind of game to entertain ourselves." The farmer asked, "What would you suggest?" The professor said, "Well, I'll tell you. I'll ask you a question and if you can't answer it, you give me a dollar, and then you can ask me a question and if I can't answer it, I'll give you a dollar." The Georgia farmer looked at him a minute and then he said, "Did you say you were a professor?" The professor said, "Yes, that's right." Then the farmer said, "Well, that's not fair. I went only through the sixth grade in school and if you want to be fair about this thing, then I'm interested in the game. Let me ask you a question and if you can't answer it, you give me a dollar, then you ask me a question and if I can't answer it, I'll give you fifty cents." The professor said, "Well, considering the difference in our educational background, I think that will be fair enough." So the Georgia farmer looked at him and said, "What animal is it that has four legs, is covered with fur and has purple horns?" The professor looked at him and repeated, "What animal is it that has four legs, is covered with fur and has purple horns?" He thought for a minute, then

reached in his pocket, pulled out his billfold, and handed a dollar to the farmer. In a minute he looked at the farmer and asked, "Well, what animal is it that has four legs, is covered with fur and has purple horns?" The farmer reached in his pocket and pulled out fifty cents and said, "I'll be damned if I know." So you see, it takes a little more than just academic training—it takes a little bit of common sense for an individual to recognize that he is in no way exempt from the laws that govern the therapeutic remedies which he applies to his patient.

It is concerning this that I will speak to you: namely, that if one in the field of orthodontics is to be most effective in the application of the skills and techniques of his hands, if one is to be most effective in the field of orthodontics in altering the emotional and mental attitudes of the patient so that the patient becomes responsive in an adequate way to the therapy that is being applied, then that man must be a certain kind of person in himself. I make no apologies for addressing a group of professional men in this way, for in the counseling I do in the City of Charlotte it is no unusual thing for a professional man in the medical service to come to see the minister because of the things that are happening to him professionally due to his failure to take into account in his personal life the things that he knows to be true in the life of his patient. I would simply enumerate those characteristics that I think every professional man should strive for and achieve if he, within himself, is to be the kind of person who has most harmoniously brought together in integration the basic elements of living and if, by that integration, he is to make the most successful impact upon his patients.

The first thing is simply this: a man must have confidence that is based not upon what he can do himself, but a confidence that is based upon the orderliness of the universe because of the character of God. I would not impose any theology upon you; I would simply say that the man who achieves confidence today is the man whose confidence must be predicated not upon his wit and his skill, but upon the firmness of the footing upon which he puts his feet, and in a time of transiency and relevancy it is significant that every man should find a faith in the orderliness of his universe upon which he predicates his practice of orthodontics as well as the practice of his daily behavior. Add to that, if you will, that flexibility with which one is able with equal confidence to meet the situations of accident and chance, knowing that we do live in a universe in which all things are not orderly but in which there is the element of accident and chance to rear its frightening head from time to time and to bring the complete upset of the finest projected plans. The healthy-minded individual is the individual who is able, with confidence, to face the variables as well as the certainties. This is the man who transmits something to his patient because he has it within himself.

He is the man who is able to cope with the surprises, as well as the certainties, of living. Then there is the capacity of the individual to meet social situations in such a way that there will be no resentfulness, no ill will, no harboring of the grudge. I think of an outstanding professional man whose physician sent him to the minister's study because this man, even without a peer in his community, was losing ground rapidly, not because of any chemical condition in his body, but because of the resentment and the bitterness that he bore in his

heart toward the administration of the hospital in which he worked. One does not often associate with such lofty achievement in the field of surgery a man who comes in humility to the minister's study to acknowledge that there is something inside that is too big for him to handle and that it is destroying his life. I never go into the hospital and pass that man in the hall, but that I have a feeling of profound gratitude that one had an opportunity to provide for a man the thing that he had provided for so many patients of his own—an emancipation from self-destructiveness due to the spirit of ill will, hatred, and resentment. No man is competent to put his hand to the destiny of a human life but that his competence springs from an inner sense of cleanness in that he harbors no dark areas of such resentment or ill will. It will destroy the patient, and it will destroy the physician as well.

It is important that the physician attain that maturity where he is able to measure decisions with a minimum of tension and in a minimum of time. The kind of man who understands that this thing which eats away the life of the patient and alters the physical processess in his body, the anxieties that are unresolved because of the inability to make decisions, affects him as well; and as he comes to that maturity of a problem-solving technique where, in all areas of experience, he stands in the dignity of one who, with calm collectedness, is able to face any issue of life and face it with the alternatives and the consequences of each and elect the superior consequence, not in terms of any personal feeling but in terms of the evaluation of personality—this is the man who has strength in himself, and his hands will remain steadier for a longer period of time and his physique will show strength beyond normal exhaustion because there is within him that harmony that is not destroyed by anxiety.

One could go on and speak at length of other qualities, but I would not speak longer of these qualities save to simply remind you once more that it is a wise word—"Physician heal thyself." The laws which govern the well-being of the patient govern the well-being of the physician and the minister as well. And here I should become, without apology, a bit autobiographical, for, like you, I felt I knew what was good for my people, but until eight years ago I had never found it as the good reality in my own life. Eight years ago, in an experience that was unforgettable because it involved a person who was sent by the medical profession suffering from an incurable malignancy, one came and said, "I have a ball of fear in my throat and I'm choking to death on it." And I realized that the familiar nostrums that were purveyed were inadequate for the needs of this one. One had to find, himself, that which was true for all men and in the search one discovered that there is a way to achieve that inner stability of confidence, of courage, of quiet peace; it is not the way of a patent remedy, it is not the way of one, two, and three, but it is rather the way of a man stepping out on some things which he knows and beginning to live like a person who knows these things to be true.

It was in this manner that I discovered that if you want to find real adequacy in life, then step out on the reality of your own inadequacy and the simple conviction that a man's inadequacy is made adequate only by the conscious awareness of God. I have seen it happen among physicians in our city. I have

seen it happen among dentists who are not present here tonight, of course, who, gravely disturbed by inadequacy, found a way to begin each day in such a companionship with One who is greater and stronger than any of us that they felt adequate for anything that might happen.

There is a different step for the body, there is a different beat for the heart, and there is a healthier flow in the digestive system for the man who knows that he and his God are big enough for anything that may happen. This is no pulpit platitude. This is but a return to the things that men know to be basic and fundamental, out of which one is able to move with a new confidence and thrust toward life. Here is the manner in which one brings the proper relationship and complimentary pattern between the impact of others upon himself and the profound inner convictions of his soul. For every man, in terms of the Chicago University sociologist, must find some way to balance the radar impact of what others do to us and the inner gyroscope of what one in his own soul knows he must be and do. Fortunate is that man who is able, with a minimum of tension, to hold firm to the inner convictions that have stabilized his life, and yet always, in holding true to the things that he knows to be true, to be sensitive to the needs and the worth of others.

Surely in the literature of orthodontics there are men to be named, unknown to me, but I always cherish the memory of that great gynecologist and obstetrician of Hungary, Dr. Semmelweis, who had just given to the medical world the answer for puerperal fever. I see him now, in his own delivery room in his hospital, saying to the young internist, "This tragedy of the dying mother is on our hands." And, looking at his own hands, he knew that the infection had come from himself. By the demands he imposed upon himself and his associates, he demonstrated that the killers were those who had delivered the women. He was always sensitive to the feelings of those who were his associates, yet never deviated from his own inner convictions (although they put him in an institution for the insane), never once altered his course, but never once with ill will or hatred denounced those who had abused him.

Great and towering is the man who gains his sense of direction by the truth of his profession and lives by it within himself, and yet always looks with understanding and sensitivity to the impact of other persons about him. I do not intend to be melodramatic, but I say to you that human life is very, very sacred and when, by the skill of your hands, you bring to pass changes of facial characteristics that, had the malocclusion continued, would have meant a warped, distorted personality you have put your hand to the Hand of God. But a man must take care that the hand that is so capable is the hand that will remain strong; that the mind that is so alert is the mind that will always be open to the new truth; and that the spirit that must be so stable and mature will never be distorted by any of the aberrations of human behavior in himself or in others.

# CARE OF THE DECIDUOUS TEETH AS THE BASIS OF OCCLUSION OF THE PERMANENT DENTITION

LEUMAN M. WAUGH, D.D.S., D.C.D. (HON., U. MONTREAL), F.A.C.D.,
NEW YORK, N. Y.

MR. PRESIDENT, MEMBERS OF THE CANADIAN DENTAL ASSOCIATION, LADIES, AND GENTLEMEN:

IT IS indeed an honor and a rare privilege to address you on this occasion. The invitation came while I was preparing a paper for the meeting of the American Association of Orthodontists, which I had resolved would be my last for quite some time. However, the compliment implied in your invitation and the fact that it would give me an opportunity to bespeak my respect and gratitude to one whose memory I revere as that of a friend and benefactor made its acceptance mandatory.

Some five years ago, when my opinion was asked regarding the establishment of the George W. Grieve Memorial Lecture, I felt that it would be most approporiate for several reasons. Foremost, George Grieve was one of the first two Canadian dentists to fully limit their practices to orthodontics, a courageous step in those early days. This took place about 1907, with both men practicing in Toronto, Ontario. Second, George Grieve was always an advocate of progress in the field of dental health service, and the welfare of the public was paramount. Third, he was one of the true pioneers in the specialty. He did much in its development and encouraged others to prepare themselves for special practice. He urged me to limit my practice and gave me advice and help after I did so. I hope that I may be able to contribute something today that will be worthy of his memory and which would merit his approval if he were among us, and who, in the face of wireless phones, world-wide radio, and television, is bold enough to assert that he, in some way, may not be in communication with us.

I was informed that I should choose a topic in the field of prevention in orthodontics; also, that the three preceding lectures had been presented by our respected colleagues, Gerald Franklin, Vernon Fisk, and Spencer Atkinson—all friends, fellow practitioners, and teachers of orthodontics in university dental schools. I have read their lectures and have chosen a simple but important

The George W. Grieve Memorial Lecture, delivered at the annual meeting of the Canadian Dental Association at St. Andrews-by-the-Sea, New Brunswick, Canada, Sept. 6, 1954.

This article is being published concurrently in the Journal of the Canadian Dental Association.

All illustrations are original. Those of skulls were made from a series of fifteen collected by the author. They range in age from birth to the fifteenth year, with one from adulthood.

subject which, I trust, may serve to complement their presentations and give this audience something that may be taken home to be applied in daily practice for the welfare of the patient.

Prevention in orthodontics is largely in the hands of the general practitioner. It is he who first sees the child patient and it should be his responsibility to detect early those conditions which predispose to malocclusion of the deciduous teeth which, if left uncorrected, will become aggravated and lead to malocclusion of the permanent teeth. The general practitioner should either correct such conditions without delay or refer them for treatment. This is the only means by which dentistry can hope to provide the increasing need for orthodontic care; the specialist alone cannot do it.

The general practitioner has the best opportunity to educate parents to the realization that deciduous teeth are fully as important as the permanent ones, and in some respects even more so, and that an investment in their early care will be of immediate benefit to the child and will pay priceless dividends later. As Philips Brooks said, "He who helps a child helps humanity with an immediateness which no other help given to human creatures, in any other stage of human life, can possibly be given again."

The teeth should be examined regularly from the second year on and should be given prompt attention in a manner that will maintain the full arch length from the second deciduous molar around to the one of the opposite side. This is imperative to the natural development of normal occlusion of the permanent teeth. In all but a very small percentage of cases this serves to provide sufficient jaw area for the permanent cuspids and premolars. All fillings in proximal surfaces must fully restore the mesiodistal size of the tooth crown and the anteroposterior length of the arch so that the permanent first molar is guided to erupt in its normal distal position. When deciduous teeth are prematurely lost, a space maintainer must be placed to prevent reduction of the space by the mesial shifting of the tooth back of the one lost. The maintenance of the full length of the deciduous arch to about the twelfth year is the most important precaution against crowding of the permanent buccal teeth because the permanent first molar, the keystone of the arch, erupting distal to the second deciduous molar, grows into its normal position in the jaw and cranium. This is the most important factor in preventing the need for extraction of good permanent teeth as a therapeutic measure in orthodontics. The upper permanent first molar is more important than the lower. Pressure habits that tend to deform the growing jaw must be observed and expeditiously overcome.

Above all, dental caries must be detected early and given prompt treatment. The parent must be told that candy and all sweets made from refined sugars are the great cause of tooth decay and that the child must be taught the resultant harm to the teeth. Substitute dried fruits (figs, raisins, dates, and prunes), nuts, and fresh fruits (bananas, apples, peaches, oranges, pears, grapes, etc.). These contain enough sugar to supply body needs and are not active in tooth decay. If the candy habit cannot be broken, then sugar in limited amount should be methodically eaten after meals and the teeth cleaned within ten minutes with a brush, efficient dentifrice, and a thorough mouth bath, churning water about

the mouth and especially between the teeth. Water is usually available, even though a brush may not be. Be sure to bathe the mouth thoroughly, even if the water has to be scooped up in the hands from a brook, as when on picnics or camping. Tooth decay has been proved to take place within ten minutes after eating refined sugars (candy, syrups, molasses, oversweetened drinks, and sweet desserts), and recurs repeatedly no matter how often the sweet is eaten. We believe it is safe to say that dental caries, either neglected or improperly cared for by the dentist, is the Greatest of all Causes of Malocclusion of the Permanent Dentition. It is worthy of note, in this connection, that the primitive Eskimo, having no sugar and therefore no tooth decay, also has the highest percentage of normal occlusion of any known race. Chewing gum and candy, sweetened without sugar, are being put on the market. These will not cause tooth decay. They are equally wholesome and are strongly recommended.

Malocclusion of the deciduous teeth does occur, but in much smaller proportion than it exists today in the permanent dentition. When present, the patient usually should be sent to the specialist for consultation. The dentist, after a conference, can decide whether he wants to care for the condition himself or have the orthodontist take over and make correction while in its incipient stage. This cooperation often prevents an aggravated and complicated condition from developing, thus applying the old and much quoted truism, "A stitch in time saves nine."

It is surprising how the cost can be kept to a minimum by judicious early treatment. For families of low income, the orthodontist can, if necessary, suggest a compromise treatment at a low cost that will provide efficient mastication and good facial appearance. Just as the best dentistry cannot be afforded by people of all social levels, and less costly and compromise dentistry must be restorted to, in like manner the orthodontist can do much and the earlier he sees the child, the more he can accomplish at the fee the patient can afford.

From ten years' experience on the Organization and the Advisory Committees on Orthodontic Care of the Departments of Health of the State of New York and of the City of New York, I feel safe in stating that orthodontists must give greater thought to providing care for those in the low income brackets as does the general practitioner in dentistry. The pioneers in orthodontics, including the one whose memory we are honoring today, were inspired by their leader, Edward H. Angle, to reach for the stars, to develop and provide the very highest type of service, the most nearly ideal occlusion that it is possible to attain, and rightly so. We believe that "a man's reach should ever exceed his grasp" and we give all credit to our leaders. No group in dentistry has ever labored with greater energy and devotion than they. Orthodontics then was a new specialty that had to prove its worth. This was more than one-half century ago, when many dentists repudiated the benefits of straightening teeth. At first it appealed to our patients mostly as a cosmetic procedure and parents had their children's teeth "regulated" as a beauty measure. Untold hours have been spent by orthodontists in explaining that it is done primarily as a health measure; that teeth in normal occlusion are more efficient in mastication, are more easily cleansed, last longer, and look better when placed in normal relationships; and

that standards of health and standards of beauty go hand-in-hand. Fifty years ago it appealed mostly to the wealthy. With passing years and broader appreciation, its benefits have become so impressive and apparent that now it is sought by the masses. Here we may wisely apply the rule: "Strive for the ideal; studiously compromise for the practical."

The length of time needed in complicated cases treated for near-ideal results, with its consequent high cost, made, and still makes, it impossible for very many worthy children to have such health care. If orthodontics is as beneficial a health service as we orthodontists tell ourselves it is, we must zealously endeavor to help provide such care for future generations of all classes. The two essential factors are (1) early care and (2) compromise treatment that will provide efficient occlusion and a pleasing facial contour within the family budget. The satisfactory experience in the Departments of Health of the State and City of New York will, we hope and believe, attract the interest of similar groups to provide means for the care of indigent children who have a crippling and handicapping condition.

Brief reference to the experience of the Departments of Health of the State and City of New York during the past nine years perhaps will be of interest. In 1945, a committee of five members of the Northeastern Society of Orthodontists (then the New York Society of Orthodontists) was nominated by the Society and appointed by the Commissioner of Health of the State of New York to serve as the Advisory Committee on Orthodontics to the Department of Health. Soon after that, the Commissioner of Health of the City of New York appointed the same committee.

It was our duty to set up standards for the launching of the program. These, throughout the years, have proved so sound in practice that a report just received from David B. Ast, Director of the Bureau of Dental Health of the State of New York, attests its success. The number of cases currently under treatment are: (1) upstate New York, about 800, with an annual cost of approximately $190,000.00, and (2) City of New York, about 1,000 cases, with an annual cost of approximately $220,000.00, with the number of cases increasing annually. It is stressed here that the treatments, whenever possible, are carried out in the private offices of the orthodontists comprising an approved panel.*

Quoting from the *American Journal of Public Health*,[31] the editor commented as follows:

> This is the story of 1500 children with severe orthodontic handicaps who come from families unable to pay the high costs of remedial care. This state-wide rehabilitation program offers them hope for a normal, productive life. Something new!

It seems a sounder practice to invest in the health of a child, both physically and mentally, than to have him grow up with a handicap that may result in his becoming a public charge in later life, and bad occlusion, hideous faces, and indistinct speech from malformed mouths and cleft lips and palates can do just

*Full details may be obtained by writing to the Bureau of Dental Health, David B. Ast, D.D.S., Director, 39 Columbia St., Albany 7, New York.

that. It is all right to "hitch your wagon to a star," but in so doing let us not forget, and thereby neglect, the large percentage of our children who have not been endowed by Nature to ever become "stars."

Parents of prospective patients have told me that their dentist has advised waiting for treatment until after the deciduous teeth have been fully replaced by permanent successors, their thesis being "Why straighten teeth that will be lost?" We have even heard of dentists advising against the practice of filling deciduous teeth because they will soon be replaced. Such advice must be regarded as the most harmful that can possibly be given the parent. Normal occlusion has long been accepted as the basis of the practice of dentistry and cooperation in dentistry for children must be increasingly apparent. Without the aid of the general practitioner in the field of prevention, orthodontics will be greatly hindered in its aim to eventually make possible treatment for all who seriously desire it.

With few exceptions, we, the dental graduates of yesterday, were given little or no instruction in orthodontics in our undergraduate courses. No dental school has ever claimed to prepare its students upon graduation for specialization in any field; just as in medicine and surgery, the undergraduate can be given only sufficient basic training to fit him to begin general practice. Preparation for specialization must be obtained after graduation. In dentistry, until recently, orthodontics has been neglected in the undergraduate curriculum. The chiefs of clinical departments were unwilling to give time from their schedules; and instruction, even in prevention in orthodontics, was pushed aside except in about a half dozen of our approximately forty dental schools. However, within the past five years the Council on Dental Education of the American Dental Association has become active in the development of a course in prevention for the undergraduate and soon we hope that the graduates of tomorrow will have a practical comprehension of prevention in orthodontics, based on growth and development, which will initiate a new era in dental health for the children of tomorrow.

It is encouraging that there are now some thirty accredited university dental schools offering training in orthodontics for graduates in dentistry in preparation for specialization. In 1922 there was only one. Now a minimal course of sixteen months of continuous studentship—the equivalent of two academic years—is required for accreditation by the Council on Dental Education. For the general practitioners of today, the universities should offer short, intensive courses in prevention in orthodontics, of which full advantage should be taken.

One of our foremost magazines in general education, *Correct English*, has on its cover the maxim: "The world needs more to be reminded than informed." Therefore, I shall offer no apology for referring to knowledge that is not essentially new. It will be my endeavor, however, to re-evaluate it so that we may apply this basic knowledge of growth and development of the head, face, jaws, and teeth as a guide, especially when working for growing children.

We recognize rather generally that normal occlusion is the basis of the practice of dentistry and that the development of normal occlusion is the basis of the practice of orthodontics. The growth of the face, jaws, and teeth toward

adult occlusion is an individual, progressive problem from conception to maturity. People of recent time, especially those of mixed racial ancestry, together with the many intangible influences of environment, often make orthodontic diagnosis most difficult. *The early recognition of factors that predispose to malocclusion and their prompt correction we regard as essential to the maximum development of facial bones and related musculature, the jaws, teeth, and individual functional occlusion.*

Normal function is conducive to normal growth and to normal structure and, conversely, abnormal or perverted function is conducive to abnormal growth and abnormal jaw structure, tending toward malformation of face and jaws, with malpositions of erupting teeth. Principles of growth, in our experience, teach us that the earlier any perversions in growth and development are corrected, the better the prospect of preventing the need of complicated corrective orthodontic treatment later.

In all sciences there must be a norm to be used as a standard. The only truly exact science is mathematics—two and two always make four. Chemistry is fairly exact. In the biologic studies, however, a norm or yardstick from which to reckon is equally important but not so easily found. Much effort by researchers has served to gradually shed light. In orthodontics we are fortunate to have gleaned much from collateral sciences.

An outstanding contribution was made by T. Wingate Todd,[7-9] professor of anatomy at Western Reserve University. He found much that can be utilized in a practical way by the orthodontist. In a paper presented at a meeting of the American Society of Orthodontists in 1935, he stated:

> The records of our long term studies on children now include standard Bolton x-ray pictures and records over a period of five years. It is perfectly possible therefore to construct norms of facial growth at any period of childhood, and it is likewise possible to study both the origin and the course of deviations from the norm.

Todd also says in the same paper:

> . . . I am altogether indebted to my colleague, Dr. B. Holly Broadbent, whose patient devotion to the scientific side of orthodontia was rewarded by the establishment of the Bolton study and whose technical skill and meticulous precision made possible the roentgenographic cephalometer, by which determinations of form and growth in the face can be made with accuracy and confidence.

For teaching purposes, we prepared a diagram in 1936 in an effort to illustrate the physiology of head development and growth from conception to maturity, based on Todd's findings concerning horizontal growth (Fig. 1). It is so arranged that it may be helpful to the orthodontist in timing treatment.

The diagram was designed to portray growth in all three dimensions: (a) horizontal—breadth, (b) horizontal—depth, and (c) vertical or dental height.

The periods of accelerated horizontal jaw growth were determined by Todd as follows and are depicted by boxed areas marked *1, 2, 3,* and *4*:

*1.* From the twenty-first day after birth to the seventh month. He states that this is the most rapid period of any time in life. The lower central incisor, the baby's first tooth, appears through the gum at about the seventh month.

2. From the fourth to the seventh year—the second most rapid period.

3. From the eleventh to the thirteenth year—the third most rapid period.

4. From the sixteenth to the nineteenth year—the fourth most rapid period.

In the intervening periods, growth takes place mostly in a vertical direction.

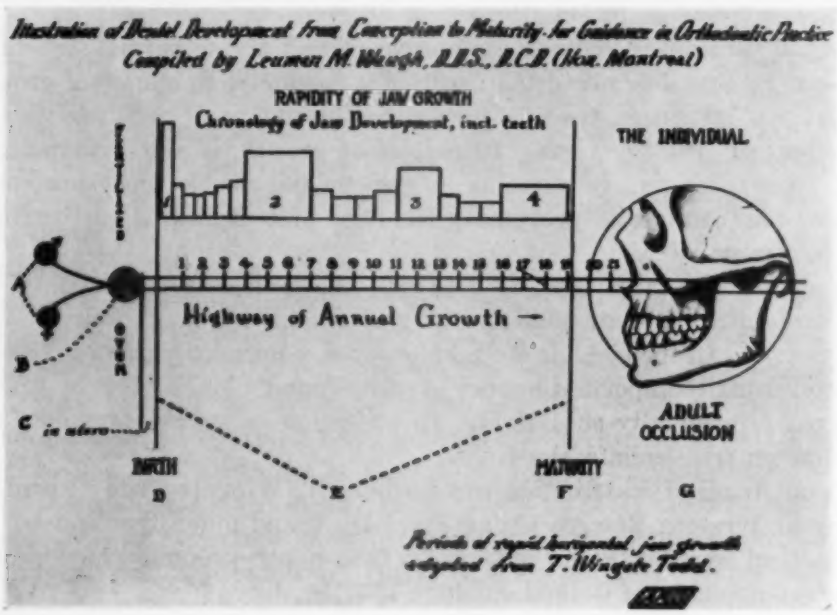


Fig. 1.—See text.

In the illustration, the upper row, consisting of boxed areas, designates growth: (a) *rapidity* by the box height, and (b) *breadth*, depicting the duration of growth spurt. The lower two long horizontal lines portray the growth highway from conception to maturity and the short vertical lines denote the years from 1 to 21. The letters denote the following:

*A*, Male and female pronuclei.
*B*, Fertilized ovum (conception).
*C*, Gestation (nine months in utero).
*D*, Birth.
*E*, Highway of growth numbered by years.
*F*, Maturity.
*G*, Individual adult occlusion.

*Detailed Explanation of the Foregoing Divisions.*—

*A*, The male and female pronuclei, by their union, coalesce the genes that determine heredity. *B*, Conception, at which time heredity is sealed. Thereafter, the inheritance handed on from ancestors cannot be changed. *C*, The gestation period includes *A* and *B*, and from this beginning the human infant is developed in nine months in preparation for birth.

The important dental events taking place in utero during gestation are:

1. Formation of Meckel's cartilage, site of the formative jaws at about the sixth week. The mandible ossifies earlier than any bone in the body.

2. Union of maxillary and premaxillary bones in the line of future upper lateral incisors at the fortieth to the forty-fifth day. Failure to unite will result in clefts of the upper lip and palate, either hard or soft, independent or in combinations, unilateral or bilateral.

3. Initial calcification of deciduous incisor edges at the fifth month, cuspids at the sixth month, molar occlusal surfaces at the sixth month, and permanent first molars at the seventh month in utero. The full breadth of the deciduous crowns is formed within the first few weeks after the tooth buds appear, there being three calcification centers for each incisor and four centers for each molar.

4. At birth the tiny jaws contain twenty-four tooth follicles, twenty for deciduous teeth and four for the permanent first molars.

Fig. 2.—Human skull at birth. The tiny jaws contain twenty-four tooth follicles, of which twenty are for the deciduous teeth and four are for the permanent first molars. The crowns of the deciduous teeth have attained their full width and are positioning for eruption. This explains the need for most rapid horizontal growth from the twenty-first day after birth to the seventh month, at which time the lower central incisors erupt.

5. The breadth and length of forming teeth must be considered separately when studying the growth of jaws and the eruption of the teeth in the development of occlusion.

The breadth of the incisal edges and occlusal surfaces of the teeth attains full size soon after the tooth buds first form; the deciduous in a very few weeks and the permanent in a very few months. All crowns are fully formed before eruption.

The length, or vertical height, of each tooth requires several years after eruption for completion of the root ends.

The urge stimulating most rapid growth from the twenty-first day to the seventh month is due to the fact that the deciduous crowns had all attained their

full breadth before birth; hence, the need for rapid horizontal jaw growth as their follicles move into alignment in the jaws during the first year.

Normal nursing or suckling is most important during the first seven months. The strenuous exercise necessitated by suckling is a very important factor in jaw growth and is the cardinal factor in the forward development of the mandible, so that by weaning time the lower and upper incisors are in normal labiolingual relations. At birth, the mandible rests in a distal position. It must be carried forward in normal suckling, which action stimulates development in the ramus, condyle, and temporomandibular joint so that the upper and lower incisors will occlude normally.

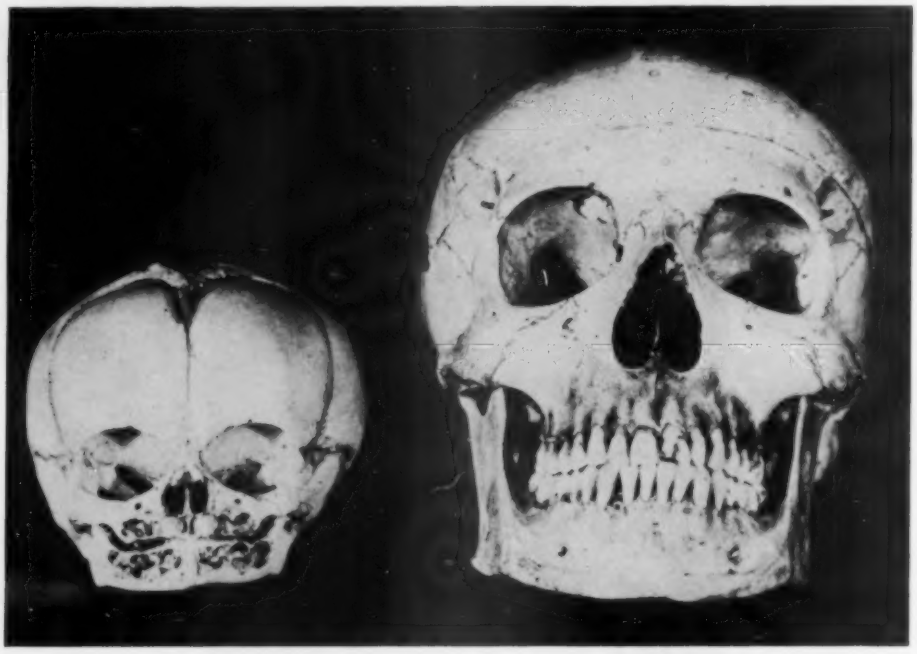

Fig. 3.—Comparison of skull at birth (left) and at maturity (right), photographed on same negative. The face areas are important. At birth, the face forms one-ninth the size of the head; at maturity, it has grown to form one-third. This rapid acceleration in the growth of the face is necessary primarily for the accommodation of the teeth.

If the infant is fed artificially, the artificial nipple must be short, closely resembling the maternal nipple, to compel the mandible to move forward in suckling. This function, properly performed during the first year prior to weaning, is, we believe, the most important factor in developing the mandible forward, thereby preventing a Class II (Angle) or distal resting position of the mandible. In the examination and recording of the dentitions of about 300 primitive Eskimos in Labrador and 3,500 in Alaska from 1921 to 1937, we found less than 2 per cent of Class II malocclusions. (In our practice, we find about 40 per cent.) This low percentage in the Eskimo we attribute primarily to compelled natural nursing and to the chewing of tough foods after weaning.

Vertical growth of the deciduous teeth will take place gradually as the roots lengthen, the incisor root ends being completed at 1½ years and the cuspids and molars at about the fourth year. The alveolar process forms as the roots

Fig. 4.

Fig. 5.

Fig. 4.—Skull at birth, lateral view, showing the resting position of the mandible at this age. In natural nursing, it must be carried forward so that the lower gum pads contact directly below the uppers, so that the milk may be suckled into the mouth. This, we believe, is a most important factor in the prevention of retracted mandible or Class II (Angle) malocclusion.

Fig. 5.—Skull of infant about eights months after birth. The incisors are seen to be erupting. Note the forward development of the mandible to facilitate masticating function of incisors by weaning time.

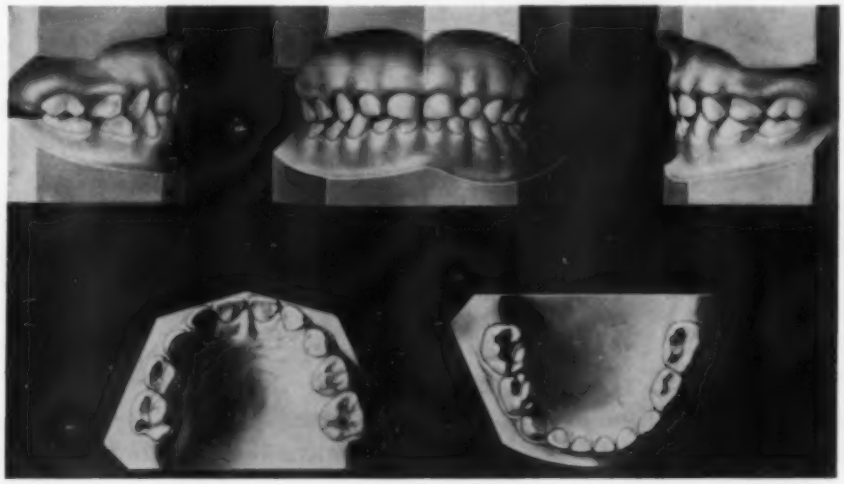

Fig. 6.—Excellent occlusion of deciduous dentition at about the third year. Made from original casts.

lengthen. Therefore, the jaw growth from the second to the fourth year is largely in the vertical direction. In the second year the buds for the premolars appear, and in the third year those for the permanent second molars appear.

Fig. 7.

Fig. 8.

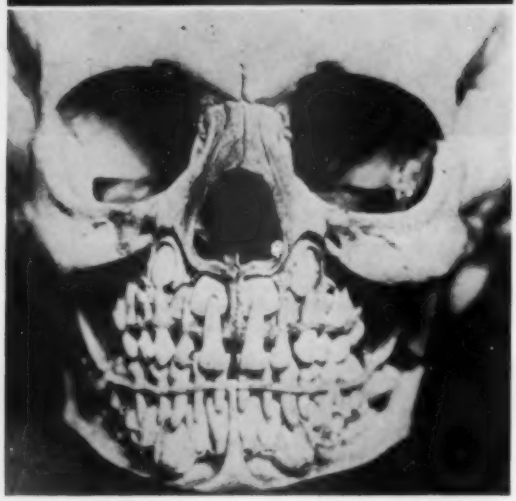

Fig. 7.—Skull at fourth year, showing deciduous root ends about completed. Note proximal contact of incisors and molars; also size and position of permanent first molar. Forty-four teeth and follicles are present at this age.

Fig. 8.—Skull at about the fifth year, showing developmental spacing of the deciduous incisors. Note the broader crowns and positions of their permanent successors. The jaws at the sixth to the seventh years contain forty-eight teeth and developing follicles, this being the largest number of any time in life. The face has grown so much faster than the rest of the head that it is now one-fifth of the head size.

The deciduous dentition is completed, root ends included, by the fourth year. The jaws, except in a small percentage, should attain their adult transarch width in the deciduous molar regions at about this time. The deciduous molars

and cuspids combined occupy sufficient horizontal area to accommodate the premolars and permanent cuspids which replace them.

The permanent first molar crown attains its full breadth at about the eighth month after birth. It gradually grows into position distal to the second deciduous molar and erupts at about the sixth to the seventh year, although its root ends do not become completed until about the tenth year.

There has long been a difference of opinion as to whether appliance therapy should be active *during* periods of accelerated growth or *between* them. While we advocate synchronizing treatment with growth, this needs explanation.

It has been our practice to observe carefully the development of the jaws, nasal cavity, and entire face, comparing this with the average norm for the age of the patient. If Nature is making satisfactory progress unaided by appliance therapy, the observation is continued by regular occasional visits to the office. However, if Nature manifestly lags, then appliances are used to nudge Nature as it were. This frequently may be toward the end of a norm period and the treatment naturally will extend beyond the average norm range of horizontal growth. This we regard as working with Nature because growth in this patient is slower than average and needs stimulation with appliances until the normal for that age has been attained. We then remove appliances and continue to note Nature's effort. In some cases no further treatment is needed. In a majority, however, a final trueing up is called for, beginning at about the twelfth year. This is usually much less complicated because of the primary preventive treatment.

We must not lose sight of the fact that the dentally normal child is not the one whom we treat—lucky youngster! He develops a good occlusion without the aid of the orthodontist; he has little or no tooth decay or has had good dentistry. It is those who grow outside the physiologic range that need our help. Good judgment here is developed only by the clinician as the result of experience which is based on the wise application of principles of growth and development. We must be constantly mindful of the guiding fact that individual growth patterns in children vary widely within the normal or physiologic range. Relative to the jaws and teeth, this may vary over many months and even as much as two years, occasionally longer, and yet be within the normal for that child.

Todd found the second most rapid period of horizontal growth to be from the fourth to the seventh year. This is due largely to the growth and aligning of the permanent incisors and cuspid crowns within their crypts in the jaws. These are staggered at first, the lateral incisors lying somewhat to the lingual of the central incisors with the cuspids to the labial of the lateral incisors. They now begin to move toward their eruptive positions. These crowns are all considerably wider than their deciduous predecessors; therefore, horizontal growth of the jaws must take place to accommodate them. Frequently developmental spaces are formed between the deciduous incisors and cuspid crowns.

The permanent first molars also are growing toward eruption, which takes place from the sixth to the seventh year. Parents should be impressed that it is a permanent tooth, the first to erupt, and the most important of all teeth and,

therefore, must be carefully watched and given the best dental care. Its loss greatly complicates orthodontic treatment and makes it next to impossible to develop a normal occlusion.

It is an interesting fact that at about the sixth year the jaws contain more teeth and follicles than at any time in life, there being a total of forty-eight, twenty of which are deciduous teeth in function and twenty-eight are growing follicles of permanent teeth. The number will decrease as the deciduous teeth are replaced by their successors. The lower central incisor is the first to be shed. The permanent central incisors erupt at 7 to 8 years, the lateral incisors at 8 to 9 years, and the first premolars at 9 to 10 years. The root ends of the central incisors are completed at 11 years, and of the lateral incisors at 12 years. The tooth buds of the permanent third molars begin to form at about the eighth year.

Fig. 9.—Skull, lateral view, at seventh to eighth year. Note proximal contact with deciduous second molar. The permanent first molar is guided to its normal distal position in the cranium when the mesiodistal length of the deciduous arch is maintained either by natural means, as absence of proximal caries, or by proper dental care. This is the first of the permanent teeth to erupt and is the largest and the most important in the development of a normal occlusion.

The third most rapid period of horizontal growth is from the eleventh to the thirteenth year. This growth takes place largely to the distal of the permanent first molar to provide bony support for the permanent second molar. The cuspid erupts at about the eleventh year and its root end is completed by the sixteenth year. The second molar erupts at about the twelfth year and its root end is completed at the sixteenth year. There is much important growth during this pre-pubertal spurt, especially in the condylar region, much of which is concerned with vertical adjustment.

The fourth and last period of accelerated horizontal growth is from the sixteenth to the nineteenth year, and is distal to the second molar, principally to provide jaw area for the third molar. The eruptive period varies widely from the sixteenth to the twenty-second year. The root ends are completed by about the twenty-third year.

Proper appraisal of the tempo of growth in the individual child is the orthodontist's greatest problem, and proper experience is the essential guiding factor. This is important in the timing of treatment. With all credit to the researcher, his findings are helpful and of use but only insofar as they can be

Fig. 10.—Occlusal view of the upper arch at about the ninth year. The full arch length has been maintained, thus guiding the permanent first molars to fully erupt in their normal positons in the dental arch and cranium. This first permanent molar relation is the greatest of safeguards against the need for extraction of good teeth as a therapeutic measure in orthodontics.

Fig. 11.—Lateral view of the dental arch shown in Fig. 10. Note the integration of the upper and lower permanent first molars. This portrays a truly normal occlusion for this age and is the ideal sought in orthodontics.

applied in the care of our patients. It is upon the clinician that we must rely for final judgment and best guidance, the general practitioner and pedodontist in prevention, and the orthodontist in consultation and treatment.

SUMMARY

The most important preventive procedure in orthodontics is the maintenance of the full deciduous arch length from the distal surface of the second molar around to that of the opposite side until the teeth are replaced by their successors. The permanent first molar thus is guided in eruption to its normal position contacting the distal surface of the second deciduous molar and should be so retained until all the deciduous teeth are replaced at about the twelfth year. It is the most important of all teeth and must be kept in perpetual health and efficiency. This we recognize as the imperative factor in the development of normal occlusion of the permanent teeth.

If the full length of the deciduous arch is not maintained, the permanent first molars almost invariably shift to the mesial, resulting in too little jaw area with crowding and malalignment of the premolars and cuspids as they erupt, and orthodontic treatment thus becomes a necessity. In normal cases the deciduous molars and cuspids provide sufficient anteroposterior jaw length to accommodate their permanent successors. Therefore, horizontal growth in this region is not necessary after the fourth year.

In extreme cases of mesial shift of the permanent first molar, extraction of good teeth may become necessary for the attainment of a pleasing result. However, it must be regarded as a compromise. Early treatment is the best safeguard against the need for such a procedure. It should be synchronized with the normal growth of each individual child. In the buccal segments, for the correct alignment of premolars and cuspids, the jaw area should be large enough to receive these teeth in advance of their eruption, and the correct distal position of the permanent first molar assuredly provides for this. Mesial shift should be corrected as soon as detected by moving this molar to its normal distal position. Extra-oral pressure, with headcap or cervical anchorage, is often indicated.

In the incisal segment, horizontal jaw growth continues after eruption. While the permanent incisors are considerably wider than their deciduous predecessors, there is some latitude in that growth of jaws forward and downward in this section continues during and after eruption.

Should developmental spacing of deciduous incisors be insufficient to provide an adequate area for their eruption in alignment, the tongue and lips in function tend to guide them into alignment as growth of the jaw takes place during the two or three years following eruption, provided there is no mechanical interference, as when teeth are in-locked or in crossbite, or when supernumerary teeth are present. These conditions should be corrected without delay and should take only a short time. The appliances should then be removed and Nature given her opportunity. Quite frequently it will be necessary to align them finally during a secondary period of treatment. Protruding upper incisors should be corrected promptly to protect them against the danger of breakage.

Deep overbite, when the lower incisors wound the mucous membrane of the palate, should be corrected promptly. Abnormal labial frenum should receive

early treatment by appliance pressure from the distal surfaces of the upper central incisors, the frenum thus being compressed with resultant resorption due to diminished blood supply and impoverished nourishment.

Open-bite, almost invariably, is due to harmful pressure habits of biting or sucking the tongue, lips, finger, or thumb. This should be corrected as early as is expedient. Relapse of well-aligned teeth will recur unless the causative habit is permanently broken.

Certainly, the most harmful advice that can possibly be given the parent is that orthodontic care should be deferred until all the deciduous teeth have been replaced by their permanent successors at about the twelfth year.

## CONCLUSIONS

1. Dental caries of the deciduous teeth, when neglected or when not given proper dental care, is the principal cause of malocclusion of the permanent dentition.

2. Dental restorations of the deciduous teeth must replace the full mesiodistal dimension of the natural tooth, and space maintainers must hold the full space of any prematurely lost tooth and should be so constructed that they will not retard or deflect the eruption of the permanent successor.

3. Malocclusion of the deciduous teeth should be recognized early and promptly corrected while in its incipiency by the combined care of the general practitioner and the specialist.

4. Early treatment should be synchronized with the growth pattern of the individual child.

5. After the early removal of interferences with normal growth of jaws, teeth, and face, Nature should be stimulated, as a principle, without appliances to the maximum of the patient's inheritance before final mechanical therapy is resorted to. It is when Nature manifestly lags that orthodontic appliances should be used.

The best result is paramount and the simpler the appliance and the shorter the period worn, the better. The young patient who, after all, is the true excuse for orthodontics thus is best served and made happy.

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# SECOND PREMOLAR EXTRACTION IN ORTHODONTICS: PRINCIPLES, PROCEDURES, AND CASE ANALYSIS

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THE challenge in orthodontic diagnosis does not rest entirely in those cases that require extraction or in those in which extraction is not indicated. It lies with equal responsibility in that extensive group known as the border line—neither authentic extraction nor genuine nonextraction. Far too often, the orthodontist must determine whether the best compromise is slight spacing with extraction or moderate crowding without extraction. He hopes, of course, to avoid either of these alternatives. Success or failure depends on a recognition of the limitations, as well as the possibilities, of orthodontics and on the proper selection of teeth to be removed in those cases in which extraction is indicated.

It is the mild, borderline case that demands careful analysis. Retaining all the teeth requires a satisfactory balance between total tooth material and available supporting bone. Extraction of teeth must be considered in all cases with a limited amount of basal bone, present or potential, in which to reposition irregular, impacted, or rotated teeth. In borderline cases, the choice of teeth to be extracted is determined by the degree of discrepancy between teeth and bone and by the amount of space to be closed following extraction.

In cases with extreme crowding and marked shortening of arch length, very little space remains to be closed after the extraction of first premolars; often it is necessary to immobilize the first molars and second premolars to maintain whatever space is still available, and occasionally these teeth may even require slight distal movement. In contrast, removing teeth in borderline cases creates more space than is necessary. With these, proper correction requires that after the anterior teeth have been placed in their normal positions over basal bone all remaining spaces be closed entirely by mesial movement of the posterior teeth.

To do this, a delicate balance must be established between anterior anchorage and posterior resistance. Six anterior teeth do not provide particularly efficient anchorage following first premolar extraction; the molars and second premolars produce far more resistance in any space-closing procedure, and they tend to remain stable while the anterior teeth move too far lingually and distally. But retaining the first premolars instead of the second premolars increases the weaker anterior anchorage from six to eight teeth. Equally important, extraction of second premolars decreases by two teeth the resistance that the buccal segments present when the spaces are being closed.

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This precaution is necessary in borderline cases if failure due to first premolar extraction is to be avoided. If the incisors are tipped lingually beyond their normal inclination, they will soon resume their typical upright positions on the removal of the appliances, and this will be followed by the recurrence of spaces throughout the arch. Ideally, anterior teeth should be moved to, but not beyond, their normal vertical positions over basal bone. If some form of stationary anchorage, bodily movement, or torque force is employed, they will not readily move farther lingually than their normal upright axial inclinations. With the first premolars providing additional anchorage, sufficient resistance is present to close the remaining spaces by mesial movement of molars rather than by excessive lingual tipping of anterior teeth. This advantage is lost if first premolars instead of second premolars are extracted in mild borderline cases.

## PRINCIPLES INVOLVED IN A SPECIFIC CASE ANALYSIS

Indications and procedures for second premolar extraction can be described most readily by a specific case analysis. The case to be considered illustrates a deceptively simple borderline malocclusion which might possibly have been treated either with or without extraction. Unfortunately, no control case is available for comparison. Fortunately, the irregularity in question responded favorably to the treatment that was undertaken.

The patient was a girl aged 11 years 10 months when appliances were placed (Fig. 1). There was nothing in her general physical examination to reveal the etiology of the malocclusion. She had had the usual childhood diseases of measles, mumps, and chicken pox. Her adenoids and tonsils had been removed when she was 5 years old. She was well balanced emotionally; there were no habits involving lips, tongue, fingers, speech, or breathing. General development and home care were unusually favorable.

Dental development also had been reasonably acceptable. Eruption of teeth, both deciduous and permanent, had been uneventful. Molar relations were normal, and the anterior teeth presented no problems in overbite and overjet (Fig. 2). Maxillary development was adequate, but the mandibular arch presented definite problems in deficient basal bone and a resulting discrepancy between total tooth material and reduced arch length. Facial balance and proportion were excellent, and muscular function and development were normal in every respect. The only etiological factor that could be determined was the premature loss of the mandibular right deciduous cuspid. Very likely this was the result rather than the cause of the shortening in mandibular arch length.

The most apparent evidence of malocclusion was in the mandibular right cuspid and lateral incisor area (Fig. 3). The cuspid had erupted to the labial and the lateral incisor was extruded and displaced lingually. All the mandibular incisors had moved to the right, with a resultant median line deviation of approximately 3 mm. This shifting of mandibular incisors permitted the left cuspid to move mesially so that its chief opponent was the maxillary left lateral

Fig. 1.—Photographs of the patient before treatment illustrate facial structures which should not be disturbed by labial movement of anterior teeth. Photographs taken one year following retention show that proper balance and proportion and a pleasing appearance have been maintained.

incisor. The mandibular right second premolar was rotated, the left second premolar was slightly impacted, and the mandibular second molars appeared to be somewhat elevated. All these conditions contributed to, or were the result of, a reduction in mandibular arch length.

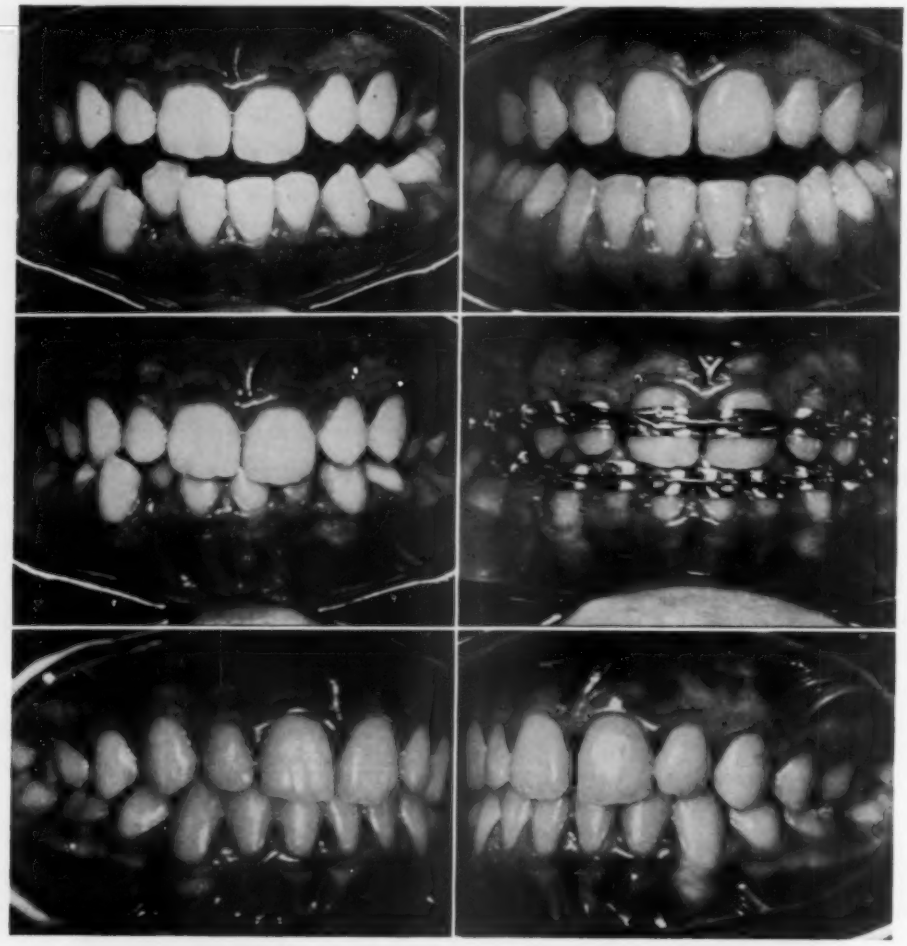

Fig. 2.—Intraoral photographs illustrate the malocclusion before treatment, the edgewise appliance in one of the final treatment stages, and the results one year following retention.

There was no irregularity in the maxillary arch to indicate even the slightest consideration of extraction (Fig. 4). As with many other orthodontic diagnostic problems, the entire basis for an extraction compromise lay in the mandibular arch alone. Other than the probability of impaction of the mandibular third molars, general alignment and occlusal relations superficially indicated that extraction was not to be undertaken.

Shortening of maxillary arch length was negligible. Based on the most conservative measurements, the combined mesiodistal diameters of the maxillary premolars and cuspid on each side totaled 22.7 mm. On the right side the space available between the lateral incisor and first molar was exactly 22.7 mm.

On the left side the space was 21.4 mm. Thus, the total maxillary deficiency was only 1.3 mm. No orthodontist should give the slightest consideration to extraction under these conditions.

The picture in the mandibular arch was quite different. Size of teeth in this arch was remarkably consistent with the maxillary arch, for the combined mesiodistal diameters of mandibular premolars and cuspid again totaled 22.7 mm., but space available between the lateral incisor and first molar on the right side was only 17.7 mm.; on the left side it was but 19.1 mm. Reduction in mandibular arch length was 8.6 mm., or an average of 4.3 mm. on each side. This is approximately two-thirds the width of a premolar. A discrepancy of this extent calls for consideration of an extraction compromise.[1]

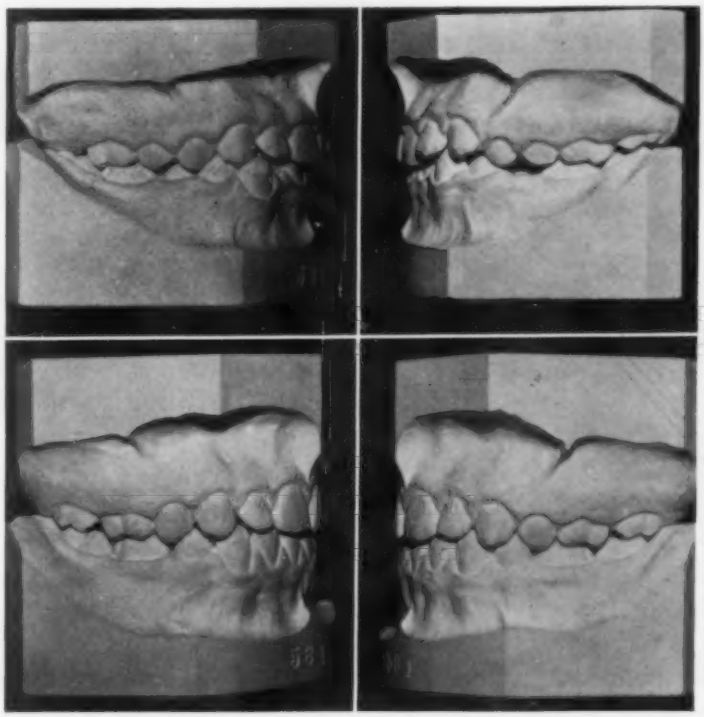

Fig. 3.—Right and left lateral views of the models before treatment and three months following the removal of all retention.

These measurements, however, are somewhat misleading and need further clinical analysis and interpretation. Obviously, the mandibular right lateral incisor was lingually displaced in relation to basal bone. Repositioning it labially to a normal position would increase the space for the cuspid and premolars. Correction of the median line relation would further increase the distance between the right lateral incisor and first molar.

However, moving the four mandibular incisors to the left to correct the median line discrepancy could be accomplished only by an equal distal movement of the left cuspid and all the teeth posterior to it, since they were all in tight contact. More likely, the left cuspid would be forced labially beyond

the line of occlusion, or the second premolar would be thrust farther to the lingual. Much of the space gained on the right side would result in a further decrease in space on the left side.

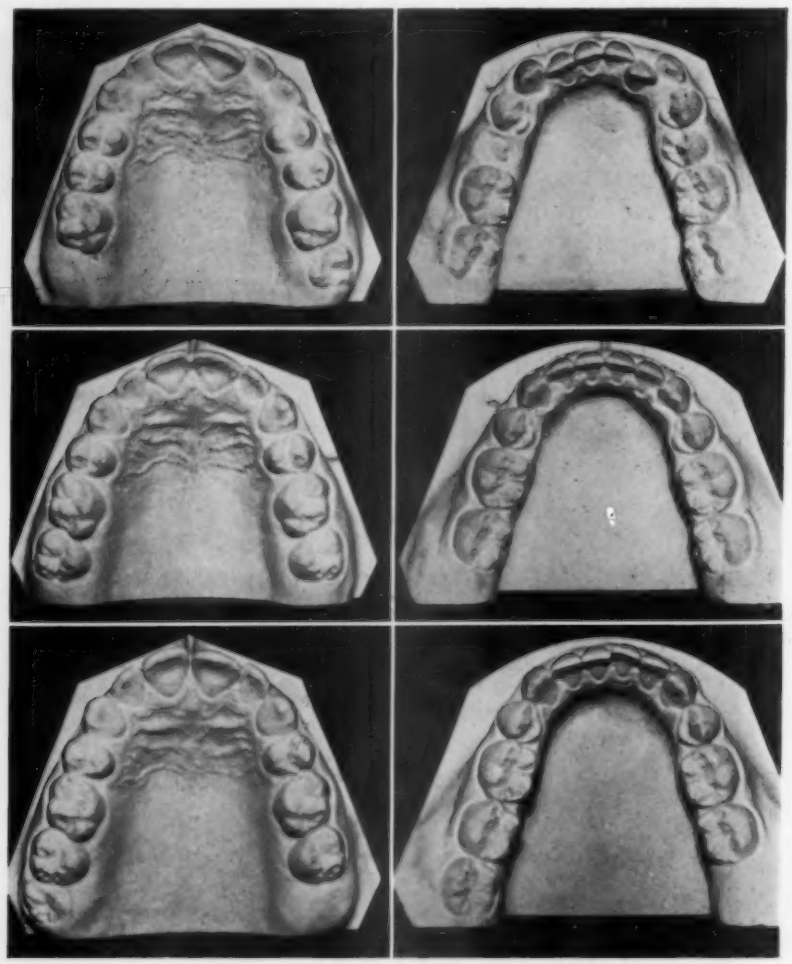

Fig. 4.—Occlusal views before treatment, three months following retention, and two years after retention. Although the mandibular anterior teeth were maintained directly over basal bone throughout treatment, the right central and lateral incisors show a tendency to relapse. The mandibular right third molar remains impacted. The case would have been a failure if extraction had not been a part of treatment.

## IMPORTANCE OF MANDIBULAR ARCH IN DIAGNOSIS

Diagnosis and treatment planning thus depended on the degree of correction possible in the mandibular arch. Viewed from the occlusal, the mandibular central incisors were upright and directly above the supporting basal bone. Considering this arch alone, the principal objective of treatment was to maintain these teeth in this position while creating sufficient space for the correction of rotations and partially blocked-out teeth elsewhere in the arch. With a full complement of teeth, this could be accomplished only by lateral expansion or by distal movement of molars.

Buccal expansion was not the answer. No permanent increase in arch length could be obtained by this procedure, for the full width of the dental arches already had been achieved by natural means. These were not narrow, elongated dental arches. Arch length was deficient anteroposteriorly, not laterally, and expansion of the mandibular arch beyond the limits of the supporting bone would end in relapse and require equally undesirable expansion in the maxillary arch.

Distal movement of mandibular molars also is unsatisfactory, even when it can be accomplished; the first molar tips distally, the distal surface of the second molar becomes embedded in the gingival tissue, and increased impaction of the third molar follows. All that this accomplishes is the transfer of a crowded condition from the anterior portion of the arch to the posterior sections of the arch.[2] These are unnatural positions for all the molars, and they will resume their former locations on the removal of the appliances. The area of crowding will simply revert back to the anterior segment when the powerful molars once again assume their original positions. The relatively weaker anterior teeth could offer little resistance, and the stage would be set for another typical orthodontic collapse.

Distal movement of mandibular molars also was undesirable as far as occlusal relations were concerned. Functional occlusion of the posterior teeth was excellent. Even if it were possible to move the mandibular molars distally, an equal distal movement of the maxillary molars also would have been necessary to maintain functional relations. Distal movement of maxillary molars was not indicated, nor would it have been permanent.

Another functional problem was involved: The natural tendency of all posterior teeth is in a forward direction. It is in this manner that teeth are kept tight together during the years in which their contact areas are worn down during mastication. Molar crowns normally tip mesially and molar roots curve to the distal. This creates the tendency for posterior teeth to move mesially during function, which in turn means increased difficulty in any attempt to move them distally. In other words, posterior teeth move mesially much more readily than they can be moved distally.

Thus, any attempt at distal movement of molars results in a distal tipping action; the roots of the mandibular molars in particular are so designed as to resist bodily distal movement. A distally tipped mandibular molar will soon upright itself, but it does so by mesial crown movement and not by distal movement of its apex. The molars can take care of themselves; the teeth that suffer are those anterior to the molars. The exception is the first molar that presents an abnormal mesial inclination due, for example, to early loss of the second deciduous molar. Under these conditions, the first molar will respond favorably to distal crown movement until it once again recovers its normal position and inclination—so far, but no farther.

Still it remained clear that the mandibular first molars had to be moved distally in this case if sufficient space was to be gained for all the incisors, cuspids, and premolars. If the first molars were the only teeth to be considered,

there would have been no unsurmountable problem in moving them distally in a bodily manner. It simply is not possible, however, to move mandibular first molars distally against sturdy second molars, impacted third molars, and inadequate retromolar areas.

Gaining tooth alignment by general expansion, including labial displacement of the incisors, was not the answer, although it would have been simple to achieve by any appliance in use today. That course was available, provided the relation of teeth to basal bone was ignored and if the patient could be induced to wear mechanical retainers permanently. Neither of these alternatives was to be considered; relapse would follow the first, and gingival recession and alveolar destruction would inevitably follow the second.

On the conviction that a stable correction could not be attained in the mandibular arch with a full complement of teeth, the next decision was which teeth to extract. The premolars individually provided no particular choice. All were vital, free of caries, well proportioned, and nearly identical in mesiodistal width. The more important factors in determining which teeth to extract were that reduction in arch length was moderate and that the mandibular central incisors already were reasonably well positioned over basal bone. Since excessive lingual movement of these anterior teeth was to be avoided, the greater part of the necessary space closure would have to be accomplished by mesial movement of posterior teeth.

### FUNCTIONAL REQUIREMENTS IN BORDERLINE CASES

The foregoing analysis was confined to the mandibular arch. As is typical in the majority of these Class I borderline conditions, the mandibular arch is the final diagnostic guide, for it is in this arch that the limitations of orthodontic treatment are most discouraging and most frequently encountered. If a treatment procedure can be accomplished without extraction in the mandibular arch, almost invariably it can also be accomplished without extraction in the maxillary arch. Extraction in the mandibular arch, however, calls for extraction in the maxillary arch if efficient function is to be maintained; otherwise, mesially repositioned mandibular first molars will be in somewhat ineffective occlusion with maxillary second premolars.

Moving the mandibular molars mesially with no corresponding extraction in the maxillary arch also leaves the maxillary second molars with inadequate occlusal opposition. Such occlusion as would exist would be the mesial margin of the maxillary second molar against the distal incline of the mandibular second molar. The maxillary second molar will not remain long in this position; instead, it will slip farther distally and continue erupting beyond the level of the occlusal plane. In this overerupted position, it would interfere with mandibular function and create undesirable mesial pressure on the mandibular second molar when the teeth were in occlusion. One solution, of course, would be to delay all treatment until the mandibular third molars were available to provide occlusal support for the maxillary second molars. To this, patients

would raise the legitimate objection that they do not want to wear appliances during their late teens if the correction can be accomplished at an earlier age.

It should be added that there are conditions in which maxillary first premolars and mandibular second premolars are the teeth of choice in any extraction program, and there are still other malocclusions in which extraction of the maxillary second premolars and mandibular first premolars is the more desirable procedure. Occasionally it is also possible to achieve acceptable function on the extraction of maxillary first premolars or of maxillary second molars, with no extraction in an opposing normal mandibular arch. This does not hold true when the maxillary arch length is adequate and mandibular arch length is deficient. When extraction of the mandibular second premolars is required in these borderline conditions, far superior function is achieved with the removal of all four second premolars, followed by synchronized tooth movement and space closure in both arches.

### APPLIANCE PROCEDURES IN CLOSING SPACES

The case was treated with the edgewise appliance. After extraction of the four second premolars, bands were placed on the cuspids, first premolars, and first molars. The usual sequence of steel leveling arch wires was placed, starting with 0.016 inch round wire and followed by 0.018 inch, 0.020 inch, and 0.022 inch round wires, until full-bracket engagement had been accomplished.

Space closure was effected by two separate procedures. The first was designed to move the cuspids and first premolars distally at the same rate in each arch so that their excellent occlusal relations could be maintained at all times. This was accomplished by pull-coil springs extending from the posterior ends of the round 0.022 inch arch wires to staples soldered distally and gingivally to the cuspid brackets. After the cuspids and first premolars had been moved distally to their normal positions, full edgewise appliance construction was completed by placing bands on the eight incisors, and new round, steel wires in the usual order were again placed to gain bracket engagement and ideal arch form throughout both arches.

The second procedure was to close the remaining spaces by further mesial movement of the molars, part of which had already been accomplished when the cuspids and first premolars were being moved distally. All the anterior teeth were now in good alignment and well positioned over basal bone. No further lingual or distal movement of these teeth was indicated. Eight teeth (four incisors, two cuspids, and two premolars) were available for anterior anchorage in each arch. More than one-half the second premolar spaces had already been closed.

Vertical closing loops in 0.0215 inch by 0.028 inch gold edgewise arch wires were utilized to complete space closure. Anterior anchorage was reinforced during this procedure by slight lingual root torque on the incisors and bends in the arch wires to create distal root movement of the cuspids and first premolars. New ideal edgewise arches were then placed to complete the correction. The proper bends were incorporated in these wires to improve the axial inclinations

of the cuspids, premolars, and molars, and tie-back ligatures were used to maintain contacting relations. Total time for correction following extraction was twenty-two months, much of which was devoted to paralleling roots and improving axial inclinations of teeth on either side of the extraction areas.

The median line deviation appeared to be self-corrective following extraction, and most of it occurred when the mandibular right lateral incisor was being moved labially. During the period when the mandibular vertical loop arch was in place, a spur was also soldered on the wire so that it was in contact with the distal surface of the bracket on this tooth.

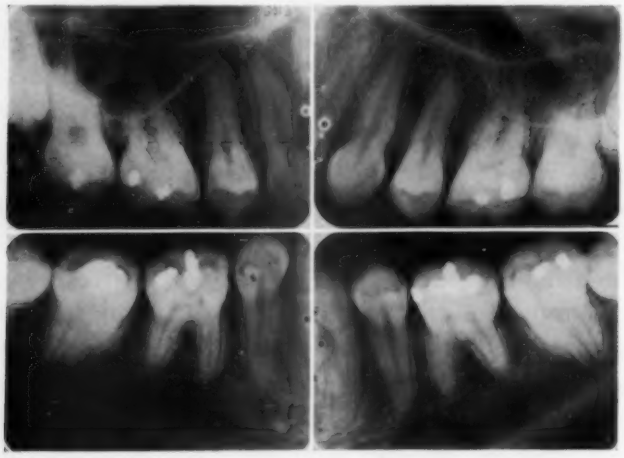

Fig. 5.—Intraoral radiograms illustrate teeth that are upright and roots that are parallel on either side of the second premolar extraction areas.

Second molar bands were not placed until spaces were closed in both arches. When second molars are included in the original appliance assembly, they increase the resistance of the first molars to mesial movement. This means an added load on anterior anchorage. Second molars should be permitted to tip mesially as they follow the first molars forward in these borderline cases. First molars thus can be moved more easily, and it is not difficult to correct the mesial inclinations of the second molars after the second premolar spaces have been closed. Once again, the maxillary arch does not prove as difficult to treat as the mandibular arch; maxillary second molars move forward with much less mesial tipping than do mandibular second molars.

Retainers may not have been necessary, but were placed as a precautionary measure. A maxillary Hawley acrylic plate was worn at night for one year, and a molar-to-molar mandibular lingual arch was worn continuously for the same period. The second set of models was secured three months following removal of all retention. Arch form is good, incisors are upright over basal bone, and occlusal relations are normal in the buccal segments. Intraoral radiograms secured at the end of treatment show no root resorption, normal alveolar bone, and teeth that are vertical and parallel adjacent to the extraction areas (Fig. 5). Facial photographs disclose good balance and proportion, relaxed musculature,

and a pleasing smile. The one area of possible disappointment is the slight separation of the maxillary central incisors, but this is due to lateral incisors that did not quite attain their full mesiodistal widths, rather than to an error in diagnosis or in treatment.

### CEPHALOMETRIC ANALYSIS AND INTERPRETATION

Cephalometric analysis was not conclusive in confirming or rejecting an extraction compromise; instead, it seemed to verify clinical observations that this was an authentic borderline malocclusion. The final decision remained a problem in clinical judgment. No angular value was particularly excessive; considered separately, all fell within the range of normal variation.[3] The general implication in the skeletal analysis was that the maxilla had exceeded the accepted means and ranges in horizontal growth, and that the mandible had attained only the minimum requirements in its anteroposterior development (Table I). Of greatest importance in the denture analysis was the interrelation between the relatively large Frankfort-mandibular plane angle and the upright positions of the mandibular incisors. The inference here was that if any change in the inclination of the incisors was to be made, it should be to the lingual, not to the labial.[4]

TABLE I. CEPHALOMETIC ANALYSIS

| SKELETAL ANALYSIS | 11/5/49 | 8/9/54 | MEAN* (DEGREES) |
|---|---|---|---|
| N-A-P† | 11 | 7 | 4.22 |
| NP-AB‡ | -9 | -6 | -4.60 |
| S-N-A | 84 | 84 | 80.79 |
| S-N-B | 78 | 79 | 78.02 |
| Difference | 6 | 5 | 2.77 |
| NS-Go-Gn | 36 | 34 | 32.27 |
| FH-NP§ | 83 | 84 | 85.33 |
| ManPl-FH‖ | 32 | 30 | 27.06 |
| SGn-FH | 60 | 61 | 60.58 |
| Denture Analysis | | | |
| S-N-Gn | 77 | 80 | 76.93 |
| $\underline{1}$-NS | 98 | 100 | 103.54 |
| $\underline{1}$-$\bar{1}$ | 136 | 135 | 130.40 |
| $\bar{1}$-GoGn | 90 | 89 | 93.52 |
| $\bar{1}$-OP | 72 | 71 | 71.79 |
| AB-OP | 89 | 91 | 92.08 |
| $\underline{1}$-NP (mm.) | 6 | 5 | 6.35 |

*Northwestern University analysis of mean values in children with clinically excellent occlusions. Recorded in degrees.

†Corresponds to Downs' angle of convexity, a measure of maxillary protrusion. The range in the controls was from +10 degrees (convex) to −8.5 degrees (concave). The mean was a straight line, or 0 (coinciding with NP facial plane).

‡Corresponds to Downs' *AB* plane to facial plane, a measure of denture base relations. The range was from parallelism, or 0, to a posterior position of *B*, or −9 degrees. The mean was −4.6 degrees.

§Corresponds to Downs' facial angle, a measure of recession or protrusion of the chin. The range was from 82 degrees (recessive chin) to 95 degrees (protrusive chin). The mean value was 87.8 degrees.

‖Corresponds to Tweed's Frankfort-mandibular plane angle, the norm for which was 25 degrees. Downs' mean was 21.9 degrees, with a range of 28 to 17 degrees.

Cephalometric records were of greater interest in this particular case in a comparison between the pretreatment and posttreatment tracings.[5] The first tracing was superimposed on the *SN* line (Fig. 6). *S* was used as the point of

registration because sella turcica shows the least change during skeletal growth. This conventional tracing shows upward and forward growth of nasion, and downward and forward movement of the maxilla and mandible, with vertical growth somewhat greater than horizontal growth.

The illusion created in this standard tracing is that of marked movement of all the teeth in a forward direction, with the molars having been repositioned mesially their full mesiodistal widths. This tracing also creates the impression that extensive bone growth occurred on the anterior surfaces of the mandible and maxilla. It does not show that these structures have been thrust forward instead by upward and backward growth of the condyle and by sutural and appositional growth in the posterior maxillary regions, in both cases against relatively constant cranial bases.

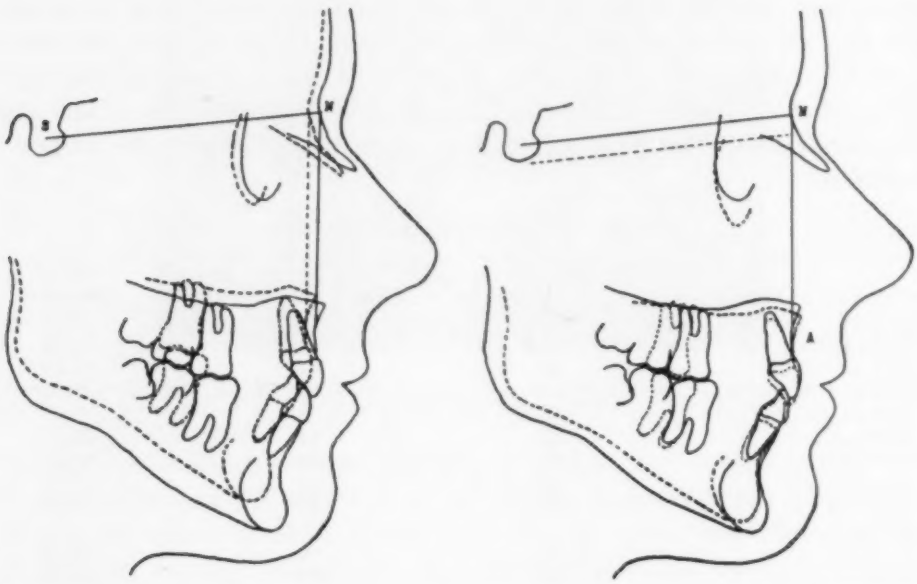


Fig. 6.—Pretreatment and posttreatment cephalometric tracings superimposed on different landmarks. The tracing on the left is a standard tracing superimposed on *SN* with the point of registration at *S*. It shows the combined effects of both growth and treatment. The tracing on the right is superimposed on *NA*, with the pretreatment tracing lowered along *NA* to an approximation of the two occlusal planes. In this manner, changes due to growth are minimized so that changes due primarily to tooth movement can be more accurately determined. Pretreatment tracings are in dotted lines; posttreatment tracings in solid lines.

A critical analysis differentiates between changes due to growth and changes due to treatment. This is difficult, as tracings are derived from structures that have changed in size, shape, and position. In this case, however, one important relation did not change; the *SNA* angle measured 84 degrees both before and after treatment. This indicated that, for all practical purposes, anterior movement of point *A* was identical with that of nasion, and that horizontal changes due principally to growth in the maxilla could be offset or minimized by superimposing on *NA* instead of on *SN*.

By also sliding the pretreatment tracing downward along *NA* until the tracings were superimposed accurately on *NA* and as closely as possible on the

two occlusal planes, evidence of vertical growth also could be reduced to a minimum. By superimposing in this manner, a more accurate interpretation of anteroposterior tooth movements within the body of the maxilla can be obtained, irrespective of changes in size and position of the maxilla itself. Since, during treatment, the teeth were maintained in excellent occlusal relations, and since changes in the *SNB* angles were insignificant, differences between mandibular growth and movement of teeth within the mandible can also be assessed in a similar manner.

This unorthodox tracing is possible in this case because there was no change in the *SNA* angle. It has the advantage of correlating changes in the position of teeth with a minimum of vertical or anteroposterior deviation due to growth. It shows that treatment caused little or no change in the labiolingual positions of the incisors. It also demonstrates that the first molars have been moved forward only one-half their mesiodistal widths, whereas in the tracing superimposed on *SN* the illusion was created that they had been moved forward their full mesiodistal widths.

The tracing superimposed on *SN* gives the more accurate record of vertical and horizontal changes due to both growth and treatment. The tracing superimposed on *NA* more accurately discloses anteroposterior changes in individual tooth position due primarily to orthodontic treatment. It illustrates further that the principal objectives in treatment in his case have been achieved—there has been neither labial nor lingual displacement of the mandibular central incisors, and the greater part of the necessary space closure was accomplished by the more desirable mesial movement of molars.[6]

## POSTRETENTION CHANGES

A constantly recurring question concerns the necessity for extraction in this apparently simple case. The basis for selecting this particular malocclusion for a discussion on second premolar extraction lies in the fact that it is as close to an authentic borderline irregularity as the orthodontist will ever be called upon to treat. Moreover, there is no point in submitting a case in which there is no problem in diagnosis and no question in treatment. Posttreatment reference to the original models shows a malocclusion apparently so mild in extent that it scarcely can be referred to as a borderline irregularity, but final conclusions in any orthodontic correction cannot be reached in only a few months of observation. What occurs in the years following is of greater value in verifying the original diagnosis and treatment plan.

Models secured two years after retention reveal that extraction had, in fact, been the proper procedure. Even with extraction, moderate relapse occurred in the mandibular arch. The right central incisor is rotated slightly to the labial, the right lateral incisor shows a similar tendency to rotate to the lingual, and the right third molar remains impacted distally to the second molar. None of these conditions is characteristic of sturdy, well-developed dental arches.[7]

No orthodontist needs to be told that this relapse would have been far greater in extent and the case a failure if all the teeth had been retained.

Facial and dental esthetics would have been jeopardized, and teeth forced beyond alveolar support would be subject to gingival and alveolar destruction and probable premature loss. The slight relapse with extraction is unfortunate and requires further observation, but the fact that it occurred confirms the original diagnosis that this deceptively simple borderline malocclusion could be treated successfully only by an extraction compromise.

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# SPEECH AND THE CLEFT PALATE PATIENT

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## INTRODUCTION

THE rehabilitation of the cleft palate patient presents one of the most complex and fascinating problems in medicine or dentistry. There are so many different structures and functions involved that an entire corps of specialists is required for the complete treatment of these patients. At the Lancaster Cleft Palate Clinic, for instance, probably the most famous of all such centers, the staff includes a surgeon, pediatrician, pedodontist, oral surgeon, orthodontist, prosthodontist, speech therapist, psychologist, and, when necessary, others such as the otologist and radiologist.[1]

It should be realized that cleft lip and cleft palate constitute the most frequently found congenital deformity existing today. In Wisconsin it has been found that one child in every 770 live births has a cleft lip or palate.[2] Of all the many difficult problems concerning these children, the one that is probably the most perplexing and elusive is the restoration of normal speech. Since speech is such an extremely complicated process, involving the delicate integration of so many parts which are also used for other purposes, it can actually be employed as a measure of the success of the entire cleft palate treatment. As a matter of fact, there is hardly any article written on the subject of cleft palate, be the author a surgeon, prosthodontist, psychologist, or orthodontist, in which the importance of the establishment of normal speech is not emphasized. Yet, despite all our increased knowledge and improvement of techniques, the speech results obtained for cleft palate patients are still far from satisfactory. One does not have to be a speech expert to detect signs of typical cleft palate speech in most of these patients, some of them with years of speech therapy behind them. As orthodontists, we usually get to see many of these patients sooner or later, and we certainly should be concerned about doing all we can to improve their speech. Orthodontists have always been greatly interested in the cleft palate problem, and have contributed much to the basic understanding of many phases of this subject. The purpose of this article is to discuss some of the considerations involved in the restoration of normal speech, with particular emphasis on those factors which might be of value to the orthodontist.

This thesis, which was given as a partial fulfillment of the requirements for certification by the American Board of Orthodontics, is being published with the consent and the recommendation of the Board, but it should be understood it does not necessarily represent nor express the opinion of the Board.

## NORMAL AND CLEFT PALATE SPEECH

Before going into a discussion of therapeutic procedures, it would be well to consider briefly the mechanism of normal speech and the characteristics of cleft palate speech. Morley,[3] in discussing the establishment of normal speech as the aim of cleft palate treatment, concludes by defining normal speech as "speech which is intelligible, natural, free to the trained ear from defects typical of cleft palate, and equal to that of the patient's environment." She feels that this sets a high standard for treatment, but certainly one we should make every effort to achieve.

Speech begins as air expired from the lungs, which becomes voice when the air stream sets the vocal cords into vibration. According to Greene,[4] "When voice is molded into syllables and words by the organs of articulation, It becomes speech. The voice mechanism includes the vocal cords and all the respiratory organs; the articulatory mechanism includes the upper portion of the larynx, the pharynx, the palate, the tongue, the teeth and the lips." It is frequently stated in speech textbooks and articles on speech that these structures must be perfectly intact and in good relationship if normal speech is to develop. The writers will then go on to state in explicit detail just what types of speech defects will develop if certain organic conditions exist. This can be misleading, since it ignores the remarkable ability of the human being to adapt to faulty structure. I[5] showed, in a study made some years ago, that there was no statistically significant relationship between malocclusions and articulatory speech disturbances. Patients have learned to speak quite well with paralyzed palates, and some have made satisfactory adjustments to missing tongue and laryngeal structures.

In the case of the cleft palate patient, there is an actual anatomic defect in some of the oral structures used for speech. The uvula, soft palate, hard palate, alveolar ridges, and lips all may be involved. Cleft palate speech is most complex. The cleft palate patient is not merely manifesting defective voice quality and distortion in consonant articulation, but the totality of his speech pattern is different.[6] McDonald and Baker,[7] after reviewing the literature, conclude that cleft palate patients have three major production problems: hypernasality, nasal emission, and misarticulation. Whereas in normal speech "m," "n," and "ng" are the only nasal sounds, cleft palate patients have nasalization of all speech sounds. The nasal escape of air results in the typical nasal snort of these patients. A characteristic facial pattern developed by many cleft palate patients to prevent this nasality is the contraction of the muscles of the nostrils in an instinctive effort to close the anterior nares. There are also definite sound substitutions which the patient performs because of his difficulty in making the plosive ("p-b," "t-d," "k-g") and fricative ("f-v," "th," "s-z") sounds in the normal manner. For some sounds the base of the tongue and the posterior wall of the pharynx form a stop position, and for others the lip of the larynx formed by the arytenoid cartilages and the arytenoid and aryepiglottic folds are used.[8] These are generally referred to as the glottal stop positions. There is a

general pattern of poor articulation of all speech sounds which frequently makes the speech of these patients quite unintelligible. Lip immobility and the frequently accompanying hearing and psychological difficulties make cleft palate speech a most complicated problem for analysis. The cleft palate child becomes so accustomed to hearing his own faulty speech that he usually is unable to distinguish it from normal speech.

Most speech experts feel that the speech difficulties can be traced to the structural deformities. They insist that the nasality and nasal emission are due to the communication between the oral and nasal cavities. In cases of surgically corrected palates, they feel that the nasality in speech is caused by an inadequate velopharyngeal closure. The difficulty in the articulation of the speech sounds they attribute to the inability to build up sufficient oral pressures and the lack of normal stop positions for consonant production. This is due to the palate clefts, faulty tooth alignment, and lack of lip mobility. While emphasizing the structural deformities as the cause of cleft palate speech, Olinger[9] states that "the palate is the most important structure in the oral cavity for speech." He feels that the palate not only assists in voice production because of its attachment to the larynx and its function as a resonator, but also is essential in the articulation of consonants. In consonant production, it assists in the formation of stop positions and also serves as a partition between the nasal and oral cavities.

It is interesting to observe that there is a small minority among speech experts who claim that the importance of the normal velopharyngeal closure has been exaggerated. McDonald and Baker[7] feel that the nasality, nasal emission, and articulatory disorders result from the habit that cleft palate patients have of elevating the mandible and dorsum of the tongue during speech. They claim that the tongue elevation forces the air stream through the nose, resulting in nasal emission and speech nasality. The speech nasality, they feel, might also be the result of resonance in a cul-de-sac resonator formed behind the larynx or root of the tongue. This elevation of the tongue does not allow freedom of the use of the tip of the tongue in the articulation of speech sounds. The tongue position may have developed during infancy to keep food from entering the nasal cavity. These patients also may have developed this habit in trying to create intraoral breath pressures for the production of plosives and fricatives. Among the arguments used by this group is the fact that frequently patients with wide, unrepaired clefts in the hard and soft palates have less nasality than patients with repaired clefts. They also claim that they have been able to eliminate nasality by training, even when a velar insufficiency precluded a velopharyngeal closure. Dr. J. D. Zimmerman[10] of Columbia University Teachers College, New York City, feels that the air pressures necessary for the production of speech sounds, including the plosives, have been exaggerated and that, even with air loss through the nasal cavities, there is sufficient pressure left for these sounds. She says that there are only a few sounds made with the dorsum of the tongue against the velum, so that a velar insufficiency should not result in gross speech disturb-

ance. As for the other palatal stop positions, she feels that even a slight amount of structure in the hard palate area should be enough to provide sufficient contact area for the tongue. She suspects that nasality is due to tension in the hyoid area and cul-de-sac resonance. This group feels that these patients require more flexibility of lip, tongue, and jaw positions. They take the position that the nasality is actually increased by the strenuous blowing and breathing exercises commonly used by speech therapists.

These differences of opinion concerning the basic causes of cleft palate speech emphasize the necessity for further research in this field. Too often the views expressed do not really rest on any sound scientific basis. Actually, the minority who minimize the structural defects have not been able to show any consistent success in the treatment of cases without a normal velopharyngeal closure. They can only demonstrate the occasional patient who somehow has been able to make an adjustment to his defect. As for the flexibility of the tongue in children with cleft palate, the evidence is conflicting. Berry,[11] in analyzing the phonetic and voice problems of cleft palate patients, felt that many of the phonetic difficulties were unrelated to the palatal and labial clefts, and that certain sounds were defective because the tongue did not make the proper articulatory adjustment. She found that in a majority of cases the tongue lacked the requisite mobility and muscular coordination for the normal production of these sounds. However, Matthew and Byrne[12] concluded that "their study on tongue flexibility did not support the hypothesis that children with cleft palates had inferior tongue activity." Until more evidence to the contrary can be produced, it would certainly be best not to underestimate the importance of normal lip and palate structure, and especially the velopharyngeal closure for speech.

With the advent of the cephalometric x-ray apparatus, it has become possible to record the vertical and anteroposterior movements in nasopharyngeal closure. Higley[13, 14] and Williams[15] found, in studying the velopharyngeal closure in vowel sounds, that the closure was not complete for all these sounds. Higley discovered that there was a relatively wide opening between the oropharynx and the nasopharynx for the tone "a," a narrower opening for tone "o," with complete closure for "i," "e," and "u." Williams found that the nasopharyngeal valve was predominantly open for the "a" and "e," and closed for the sounds "u" and "i." I have been carrying out a similar study at the School of Dental and Oral Surgery of Columbia University to determine the adequacy of the velopharyngeal closure in surgically corrected cleft palate patients. X-ray pictures taken of normal patients bear out the work of Higley and Williams. All these normal patients had complete contact of the palate and pharyngeal wall while phonating these sounds. Figs. 1 and 2 show typical x-ray pictures taken of a normal patient at rest and phonating the vowel "i." It is interesting to observe that practically all the closure is effected by the upward and backward movement of the soft palate to contact the pharyngeal wall in the vicinity of the first cervical vertebra. Figs. 3 and 4 show typical x-ray pictures of cleft palate patients at rest and

phonating the vowel "i." Although there is some movement of the palate in function, there is still a considerable amount of space remaining between the palate and the pharyngeal wall, indicating that the closure is not complete. None of the cleft palate patients tested by this technique have demonstrated a normal velopharyngeal closure. Practically all these patients had gone through considerable speech training with varying degrees of success, but all

Fig. 1. Fig. 2.

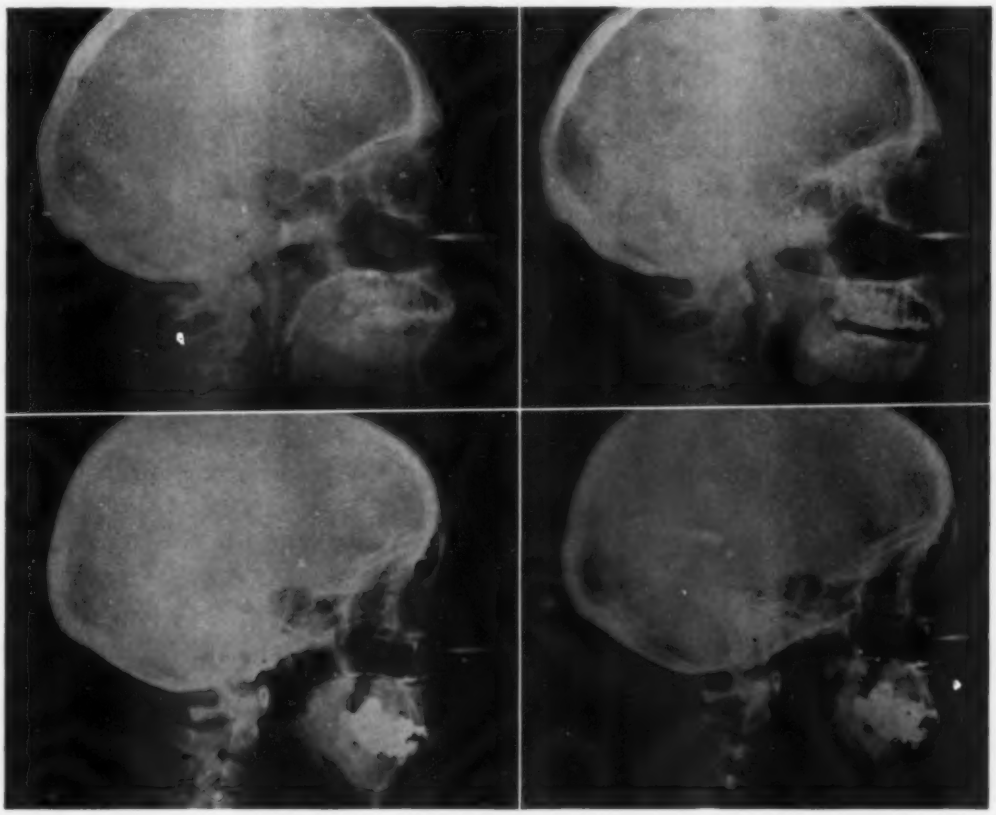

Fig. 3. Fig. 4.

Fig. 1.—Normal patient at rest. Palate is separated from the pharyngeal wall.

Fig. 2.—Normal patient phonating the vowel "i." The palate contacts the pharyngeal wall in the area of the first cervical vertebra.

Fig. 3.—Cleft palate patient at rest. Palate is separated from the pharyngeal wall.

Fig. 4.—Cleft palate patient phonating the vowel "i." Palate is still separated from the pharyngeal wall.

of them still had at least some trace of abnormal nasality. This study would seem to indicate that cleft palate surgery does not result in a normal velopharyngeal closure.

## SURGICAL CONSIDERATIONS

There have been a great many developments in cleft palate surgical techniques through the years, but basically these procedures can be divided into two groups. The Brophy adherents believe that a cleft palate is the re-

sult of failure of union of well-developed parts, and feel that it is necessary to close the cleft by compression as early after birth as possible.[3] This procedure results in abnormal narrowing and mutilation of the maxilla and has been abandoned by practically all surgeons. The von Langenbeck, or soft tissue, group believe that a cleft palate is due to arrested development, and that there is an inherent lack of tissue.[3] Most surgeons follow this philosophy, and have developed numerous modifications of the original von Langenbeck operation to attempt closure of the cleft by soft tissue flaps. As surgeons became aware of the importance of the physiologic function of the repaired palate, they realized the inadequacy of their results. This led to further operative procedures which had as their object the lengthening of the palate to eliminate the velopharyngeal insufficiency. The most notable of these was the Dorrance "push-back" operation. At the present time, there is a great deal of conflict over the effect of the various surgical techniques on the growth and development of the hard and soft tissues of the jaws. With the use of the cephalometric x-ray technique, it has been possible to evaluate surgical results more accurately. Modern research has revealed some very interesting findings which are of great importance in understanding the effect of surgery on the oral speech apparatus. Briefly, these are as follows:[16, 17, 18]

1. Five-sixths of the total palatal breadth has been accomplished by the end of the fourth year.

2. Downward and forward growth of the palate continues to 20 years.

3. Surgically unoperated cleft palate patients have approximately normal growth of their jaws.

4. Surgical correction of cleft palate limits the growth potential of the maxilla. Surgery renders this structure deficient in anteroposterior, lateral, and vertical growth. Mandibular growth in these cases remains almost normal.

5. In general, the greater the number of operations, the more marked the deviation from the normal. Early surgery appears to result in the greatest deformity.

6. Surgically repaired soft tissues grow more slowly than the surrounding tissues.

These findings have not been completely accepted by cleft palate surgeons. Many outstanding surgeons insist that the underdevelopment of the maxilla existed as part of the cleft palate deformity before operation, or was a result of the type of surgery employed.[19, 20]

Although improved modern surgical techniques have produced better results than in the past, there are still far too many cases of surgical failure resulting in facial and dental distortion. A great difficulty is that surgical procedures cannot be evaluated until many years after operation, because of the continuing downward and forward growth of the palate. A palate which seems to have been successfully closed at 2 years of age may be badly mutilated ten or fifteen years later.

Many surgeons have come to realize the inadequacy of the conventional surgical procedures in producing a normal-functioning velopharyngeal closure.[21, 22, 23] They attribute this to the anterior pull of the contracting raw surfaces on the nasal side of the mucoperiosteal flap. To overcome the many cases with poor speech results after surgery, the pharyngeal flap operation is now being increasingly utilized. It is interesting to note that this operation, which has become suddenly very popular, has been intermittently used as a method of closing the velopharyngeal gap since 1875.[21] Actually, what this particular technique accomplishes is to divide the oronasal port into two separate smaller openings. A flap of pharyngeal tissue is permanently attached to the denuded oral surface of the soft palate. In time, the flap reattaches to the pharyngeal wall and appears to pull the palate backward.

The great majority of the surgeons I interviewed were most enthusiastic about the pharyngeal flap operation and minimized the possible complications, such as postoperative bleeding, difficulty in breathing, and ear symptoms. They reserved this technique for those cases which did not respond to speech therapy, and usually would not operate until the patient was at least 6 to 8 years of age. There were several surgeons who felt that this operation was a "passing fad," and involved unwarranted surgical risks and postoperative complications. Those speech therapists who had experience with patients undergoing this operation felt that the procedure was very helpful to them in restoring normal speech. It should be emphasized that diligent postoperative speech training is essential in all these cases. The pharyngeal flap operation appears to be a most promising development, but final judgment will have to be deferred until the results have been more carefully evaluated.

## PROSTHETIC CONSIDERATIONS

The obturator, which is the appliance used for the correction of palatal clefts, was one of the earliest appliances to be used in the mouth.[24] There have been many modifications of design through the years, but basically these appliances can be divided into two groups: the movable and the fixed. The movable obturator was constructed so that it could function as a normal palate in the production of sounds. This type of appliance, also referred to as an artificial velum, has a bulb portion attached to the rest of the denture by a hinge slot, or ball-and-socket joint. The fixed obturator has no movable parts, and has the palatal portion attached rigidly to the velar portion.

The majority of prosthodontists doing cleft palate work now seem to use the fixed type of obturator almost exclusively. They feel that it is quite impractical to hope that an appliance can duplicate the extremely delicate and complicated movements of the soft palate. Fitzgibbon,[25] an outstanding authority, felt that normal speech could be produced by the contraction of the pharyngopalatine musculature on the fixed obturator bulb, and that normal palate function could be disregarded. Harkins and Baker[26] insist that a speech appliance should not attempt to restore the function of lost parts, but should create a situation whereby the residual tissues can approximate the normal movements of speech. The fixed type of obturator is certainly much simpler

Fig. 5.

Fig. 6.

Fig. 7.

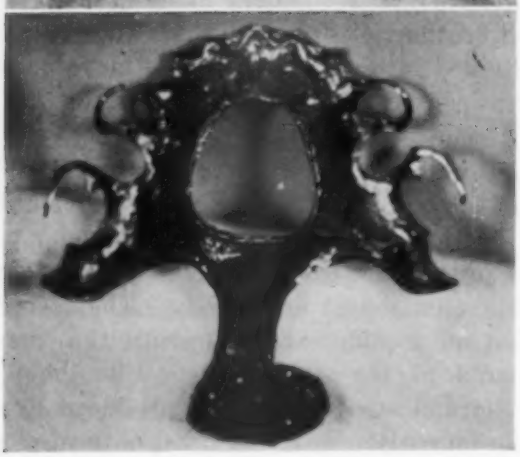

Fig. 5.—Cleft palate patient with an obturator in position contacting the pharyngeal wall at the level of the first cervical vertebra.

Fig. 6.—Cleft palate patient with an obturator in position.

Fig. 7.—Appliance used for patient in Fig. 6. The speech bulb is constructed of acrylic.

mechanically, offers less opportunity for breakage, and is much easier to construct. It is not necessary to go into a detailed description of the construction of a fixed obturator, since this has been done quite adequately by others.[24, 27, 28] However, there are several points regarding obturators which should be emphasized if maximum efficiency is to be obtained with these appliances. The use of the x-ray in the construction of obturators has not been sufficiently stressed. This procedure is invaluable in the positioning of the bulb, which should contact the pharynx in the area of the first cervical vertebra. Fig. 5 shows a radiograph with an obturator bulb making the

Fig. 8.

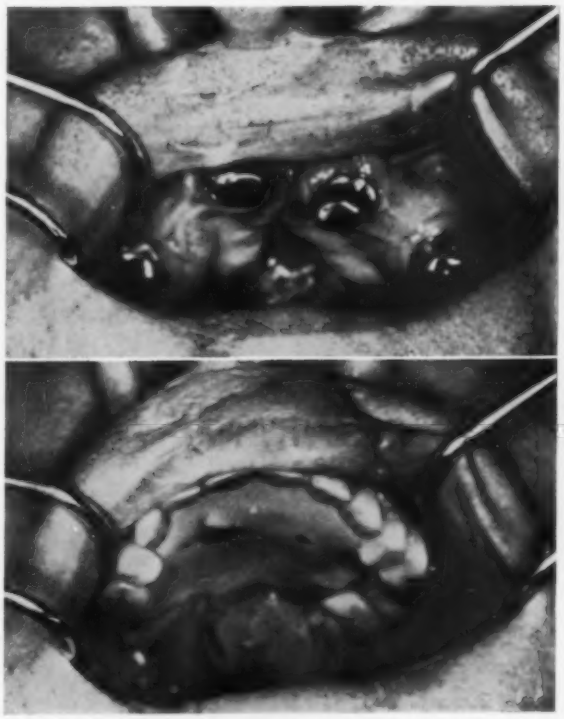

Fig. 9.

Fig. 8.—Cleft palate patient with four teeth remaining in the maxillary arch. Cast caps have been cemented on the teeth.

Fig. 9.—Same patient as in Fig. 8, with an obturator in position over the remaining teeth.

proper pharyngeal contact. The appliance should be vaulted as much as possible to permit maximum freedom of movement of the tongue during speech. This will also permit a more nearly normal resonance in the oral cavity. It should be realized that these obturators must be refitted periodically. The appliances should be checked at intervals of six months to one year to assure maximum efficiency. Quite frequently there is a stimulation of the development of the palatal and pharyngeal musculature, with a resultant irritation of these structures. Occasionally this will actually result in a speech denasality, which is due to the fact that the nasopharyngeal opening has become too

Fig. 10.

Fig. 11.

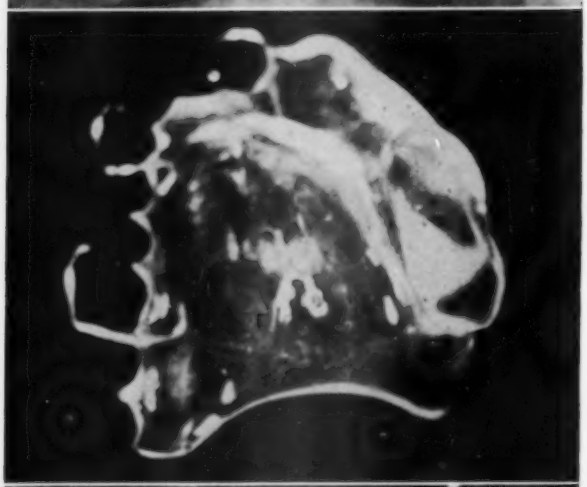

Fig. 12.

Fig. 10.—Acquired palatal defect caused by the removal of a tumor. Speech nasality was present.

Fig. 11.—Appliance constructed to correct the defect of patient in Fig. 10.

Fig. 12.—Patient in Fig. 10 with appliance in position. Speech nasality disappeared without speech training.

small to permit normal nasal resonance. If this should occur, the bulb will have to be reduced in size, care being taken not to eliminate an effective closure. With the use of the acrylic bulb, these repairs can be made quite readily. Even though an efficient obturator has been constructed, it is absolutely essential that the patient receive speech therapy if maximum improvement in speech is to occur. Figs. 6 and 7 demonstrate an obturator which was made for a patient who had a considerable amount of speech nasality in spite of intensive speech therapy. X-ray pictures indicated an inadequate velopharyngeal closure. The improvement in speech was most dramatic after the insertion of the appliance, and this progress is continuing with additional speech training.

In cases of surgical failure, where there has been a great deal of maxillary distortion, it is frequently necessary to construct an appliance completely over the remaining teeth. Figs. 8 and 9 show a case where this procedure was necessary.

It is interesting to observe that in cases of acquired clefts due to trauma or surgery, speech nasality also develops. However, after an appliance is inserted to close the defect, the nasality disappears without speech training. Figs. 10, 11, and 12 show a patient with an acquired cleft where this phenomenon occurred.

An interesting development has been the increasing use of speech aids for very young patients. These are often recommended by those surgeons who postpone palate surgery until after 4 or 5 years of age. Harkins[26] constructs these appliances for children as soon as their deciduous teeth have erupted. He fabricates a palatal portion to close the cleft, and gradually adds posterior extensions as tolerance develops.

## SPEECH THERAPY

Adequate speech therapy for cleft palate patients remains a most serious problem. There are not enough well qualified personnel in this field. According to the Personnel Registry of the National Society for Crippled Children and Adults, Inc., there are only 1,200 persons engaged in speech and hearing correction, and less than one-half of them are qualified to do speech work beyond the apprentice level.[29] It is especially discouraging to find how few speech correctionists have had any experience at all with the prosthetic speech aids used for cleft palate patients.

It is generally accepted that the assistance of a speech therapist is most valuable in the planning and execution of all prosthetic and surgical procedures. All the well-organized group cleft palate clinics have speech therapists present as equal partners with the other participants at the diagnostic meetings. After the surgical and prosthetic work has been completed, concentrated speech training is essential if any real progress toward normal speech is to be made. Most speech therapists feel that these patients should have at least two or three months of specialized speech training at this time, with lessons several hours weekly, in addition to home instruction provided by

the parents. Only in this way can the effectiveness of the therapeutic procedures be determined. If sufficient progress is not made during this time, further surgical or prosthetic measures are suggested. Unfortunately not very many cleft palate patients are able to receive the benefits of this type of speech therapy. Very few school clinics are equipped to give these patients the kind of attention they require.

Most speech therapists feel that it is best not to begin speech training until the patient has had his palate closed surgically, or had a speech appliance inserted. It is felt that not enough can be gained until there is a semblance of normal structure, and also there is always the danger of discouraging the patient.

In a general way, speech instruction for cleft palate patients involves the following:

1. Accumulation of air pressures in the oral cavity, and the prevention of the escape of air into the nose.
2. Correct articulation of all the speech sounds.
3. Teaching the patient to distinguish normal from incorrect speech. This involves considerable ear training, as the cleft palate patient frequently cannot hear how his speech differs from that of normal persons.
4. Elimination of compensatory reactions, such as the glottal stops and nasal contractions.

It is generally felt that a combination of individual instruction and group training is advisable. The individual attention is necessary to teach the patient how to make every speech sound correctly, and to eliminate his personal faulty habits. The group method helps the patient adjust to his handicap, and also gives him an opportunity to learn from the errors and attempts at correction on the part of the other members of the group.

## ORTHODONTIC CONSIDERATIONS

Cleft palate patients have so many difficulties to overcome that any improvement in the speech apparatus could be of great importance in easing the pathway toward normal speech. Tooth and jaw irregularities which might not be significant in the speech of normal patients may be serious obstacles for normal speech production in cleft palate patients because of their numerous adjustment problems. Unfortunately, the orthodontist is limited as to what he can accomplish in the treatment of many of these patients. In cases where there has been a considerable disturbance in maxillary growth, there is often little that can be done to help these patients orthodontically. It is highly doubtful that orthodontic therapy can stimulate bone growth, and therefore extensive appliance treatment should not be indicated in patients with gross tooth and jaw deformities. It is interesting to note that some surgeons are not sufficiently aware of these limitations, and still seem to place great reliance upon growth stimulation by the orthodontist.

It is not my intention to go into details of orthodontic treatment for cleft palate patients except to point out that more and more orthodontists are realizing the limitations of orthodontic treatment and are placing increasing reliance upon prosthetic restorations. Where there is a large discrepancy between the upper and lower jaws, the only method of harmonizing the lip and tooth relationship is to construct a prosthetic appliance over the remaining teeth. Figs. 8 and 9 illustrate this procedure. Any incisors in the vicinity of the cleft which have a questionable prognosis should be extracted and replaced prosthetically. Since there are so few dentists who have had any experience with prosthetic appliances for cleft palate patients, it frequently becomes necessary for the orthodontist to do at least part of this work himself. The construction of an obturator is quite often an involved and time-consuming procedure, which is unrewarding financially. However, the satisfaction that is obtained from the improvement in the facial appearance and speech of these patients following the insertion of a well-constructed appliance will more than compensate the orthodontist for all his efforts.

The role of the orthodontist in the treatment of cleft palate patients should not be limited to the correction of tooth and jaw irregularities. The orthodontist should be interested in all the problems of these patients and should follow their progress very closely. As far as speech is concerned, these patients should be observed carefully to determine whether or not they are making the maximum progress toward normal speech. If there is not an adequate advancement, further treatment measures such as a pharyngeal flap operation, insertion of a speech appliance, or improved speech therapy may be indicated. These procedures should be discussed with all those participating or interested in the rehabilitation of the patient. The orthodontist should be acquainted with all the treatment facilities available for cleft palate patients so that he can help their parents get authoritative advice and help.

The best arrangement for the diagnosis and treatment of the cleft palate patient is the coordinated cleft palate clinic. Dr. Herbert H. Cooper should be given great credit for having had the vision to establish the first group cleft palate clinic at Lancaster, Pennsylvania. It is only in an organization of this type, where all the specialties are given equal representation, that the patient can receive all the benefits of modern knowledge and techniques. Unfortunately, there are very few of these clinics in existence. Cleft palate care at most hospitals is not well coordinated, and usually it is under the complete control of the surgeon. The type of treatment given will depend solely upon his interests and experience. It is beyond the capacity of most hospitals to keep adequate diagnostic and progress records so that all the procedures utilized can be scientifically evaluated. It is only with the aid of such records that we shall be able to settle some of the controversial issues in cleft palate treatment.

Fortunately, there has been a renewed interest in the creation of cleft palate clinics. We can be very proud of the fact that orthodontists have been most active in the establishment and direction of a number of these centers.

The State of Pennsylvania has taken the lead in making comprehensive treatment available to cleft palate patients. It is the only state whose Health Department has a division solely concerned with the care of children with cleft lip and cleft palate. Funds have been provided by the State Legislature to aid those patients who cannot afford the full cost of treatment. Eight diagnostic centers have now been established in various regions of the state, where patients are examined periodically and recommendations are made as to treatment. In this way, patients are able to receive as much treatment as possible in their home areas, and still have the benefits of expert over-all supervision. This is the type of program which is deserving of the support of orthodontists in all sections of the country.

Another interesting development has been the establishment of a special cleft palate training program at the University of Illinois for persons whose professional activities relate them in any way to cleft palate children. With the assistance of a grant of funds from the United States Children's Bureau, courses of various types especially adapted to the trainee's background are given at stated intervals. It is hoped that this program will result in a better integration and communication of the vast amount of knowledge relating to cleft palate care.

All this activity in the field of cleft palate rehabilitation is a healthy sign, and it is bound to produce better treatment results. The programs of research which are now under way may finally reveal the solutions to some of the vexing problems involved in the restoration of normal speech for the cleft palate patient. Certainly, every possible effort should be made to save these unfortunate children from the crippling effects of defective speech.

## SUMMARY

A review has been made of some of the considerations involved in the restoration of normal speech for the cleft palate patient. The characteristics of normal and cleft palate speech have been discussed, with particular emphasis placed on the importance of the velopharyngeal closure. The surgical and prosthetic procedures involved in cleft palate rehabilitation have been described and correlated with some of the recent research findings. The value of prosthetic speech aids has been stressed. Notice has been taken of the importance of speech therapists in all phases of the cleft palate program. Orthodontists have been urged to take an active interest in the speech development of their cleft palate patients. It was felt that the establishment of coordinated cleft palate clinics should be encouraged as a means of promoting better treatment for the cleft palate patient.

## CONCLUSIONS

1. The establishment of normal speech is one of the primary aims of cleft palate therapy.

2. An inadequate velopharyngeal closure is an important factor in the development of cleft palate speech.

3. Surgery does not necessarily result in the restoration of a normal-functioning speech apparatus.

4. The use of prosthetic appliances as speech aids should be more widely encouraged.

5. Speech therapy should be coordinated with surgical and prosthetic procedures.

6. The orthodontist should follow carefully the speech progress of his cleft palate patients.

7. The group cleft palate clinic is the best type of organization for the diagnosis and treatment of cleft palate patients.

8. There is a great need for basic research in all phases of the cleft palate problem.

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30 SOUTH BROADWAY

# COMPLETION OF DIFFICULT DEEP OVERBITE CASES

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## INTRODUCTION

THE purpose of this article is to present a method for the treatment of difficult deep overbite cases. The need for such a method has been evident indeed in my practice and probably has been experienced at one time or another by most orthodontists. Conventional methods for reducing the overbite are usually sufficient for completing most cases in a satisfactory manner. I have found occasionally, however, a few cases where the overbite persists, even after conventional methods for reducing it have run their full course. The situation presenting at this time is a neutroclusion in the buccal segments, and the mandibular incisors, by striking the lingual surfaces of the maxillary incisors, prevent the complete retraction of the latter teeth.

About five years ago a possible solution to this problem presented itself. By using a lower bite raiser to permit the retraction of the maxillary incisors, and then switching to an upper bite plate to complete the correction of the overbite, I found it possible to conclude these cases with greater success and simplicity. It is my intention, in the next few pages, to give the logic leading to the development of this technique, when to use it, how it is used, and a case report to show how it might be used to advantage in any orthodontic office.

This method of using the lower and upper bite raisers does not, in any way, introduce into orthodontics basic principles that have not already been described in our journals.

## REVIEW OF LITERATURE

The literature contained no reference to a technique for reducing the overbite that involved a change-over from the lower bite raiser to the upper bite raiser.

Many factors were discussed, however, that contributed to such a correction:

1. The wedging action obtained when the maxillary buccal teeth are moved distally certainly tends to reduce the overbite. Porter[12] even warns that this action can cause some cases to develop into a definite open-bite condition.

This thesis, which was given as a partial fulfillment of the requirements for certification by the American Board of Orthodontics, is being published with the consent and the recommendation of the Board, but it should be understood it does not necessarily represent nor express the opinion of the Board.

2. Oliver[11] comments that many neutroclusion close-bite cases can be appreciably opened by the buccal tipping of lingually tipped or lingually placed premolars and molars.

3. In selected cases, where a supraversion of the maxillary anterior teeth exists, the overbite is reduced by intrusion of these teeth.[13]

4. It is generally agreed that flattening the mandibular arch contributes much to the correction of the overbite, but there is considerable disagreement concerning the method for doing it. This disagreement hinges on the basic controversy regarding what causes the lower arch to flatten: elevation to the posterior teeth, or depression of the anterior teeth. Broadly speaking, those who believe it is accomplished only by depressing the anterior teeth will prefer to attain this end by a full-banded lower appliance, rather than by a bite plate. Mershon[8] is most emphatic on this point, and states that any elevation of posterior teeth obtained from a bite plate will surely relapse when the plate is removed and the musculature is free to assert itself. Other men believe the anterior teeth cannot be depressed and the entire correction must result from elevating the posterior teeth. Hemley[6] published a carefully prepared report supporting this latter view. More recently, Wylie[16] pointed out that the musculature is the dominant factor in determining the amount of vertical development in the buccal segments, but that in some cases the limits permitted by the musculature are not attained. Lewis[7] agrees with Wylie, and stresses that, "Lack of optimum vertical eruption of the buccal teeth of both the maxilla and the mandible is characteristic of closed bite malocclusion."

Breitner[2] cautiously states that, when wearing a plate, "the occluding teeth are depressed and the non-occluding teeth have an opportunity to elongate somewhat due to the loss of antagonists."

Strang,[13] McCoy,[9] Sved,[14] Tarpley,[15] Fisk,[5] and many others seem to feel that both actions are possible, and that a compensatory adjustment probably occurs between anterior and posterior teeth.

I have no quarrel with any of the methods mentioned above for reducing the overbite. I employ all of them in my practice, but, despite this, a few stubborn overbite cases have continued to defy correction within reasonable time limits; it is for these few cases that the new technique finds its ideal application.

## LOGIC

The logic leading to the use of this method is rather interesting. It began when a very good friend of mine, a dentist, brought his 12-year-old boy into my office for orthodontic treatment. As is usually the way, if something is going to prove difficult, it would be with a friend's child. So it was with this boy; his case proved extremely difficult because of an overbite problem. He had a distoclusion, with an overbite of 10 mm., a freeway space of 3 mm., and no mandibular displacement with the mandible at rest. The radiograms showed that the boy's teeth were relatively susceptible to caries, that the bone was

good, that there were no root resorptions, and that all the teeth were present, including the maxillary and mandibular third molars. I diagnosed the case as an extreme maxillary protraction.

The treatment plan consisted of the immediate extraction of the maxillary right and left first premolars and the placement of an upper bite plate with finger springs to retract the maxillary cuspids.[7] This, I felt, would serve three purposes: (1) the opening of the bite, (2) the commencement of the distal movement of the maxillary cuspids, and (3) the prevention of the maxillary posterior buccal segments from drifting mesially.

At the same time, I used a full-banded appliance on the mandibular arch to flatten the curve of Spee and to achieve the proper arch form.

It was then my plan to place bands on the maxillary buccal segments and to complete the retraction of the cuspids with intermaxillary elastics. I felt the next step in this case should be the placing of bands on the maxillary incisors, the full retraction of these teeth, and, finally, the completion of the case with full fitted arches.

It became evident before too long that my treatment plan had been wrong. By the extraction of the maxillary premolars, I had aggravated the already serious overbite problem. Now, I realize that it would have been better if no teeth had been extracted, or if teeth were to be removed, it should have been the maxillary second or third molars. However, here was a difficult overbite case made much more difficult by my own mistake, and I had to do something about it.

After one full year of treatment the mandibular arch was flat and good arch form had been achieved. The maxillary buccal segments had been banded and intermaxillary elastics were being worn to the cuspids. By this time, these cuspids were in contact with the second premolars. The bite plate was still being worn, but the cuspid hooks were removed from the plate at the time the maxillary posterior bands were placed.

At this point, the overbite had been reduced to some extent. I banded the maxillary incisors and placed a maxillary Nagamoto contraction arch.[7] Of necessity, the bite plate which contacted the lingual surface of the incisors had to be discarded. At the same time, intermaxillary elastics were worn from the mandibular first molars to the maxillary cuspids.

Two months later, the mandibular anterior teeth were again in contact with the lingual of the maxillary incisors at the gingival margin. Therefore, their retraction could be carried no further, and yet they were still spaced and protrusive. The next step was to continue the intermaxillary elastics to the cuspids, construct and place a second bite plate, and discontinue the retraction of the maxillary incisors until the bite plate could open the bite enough to permit their further retraction. This process was repeated through four bite plates before the maxillary incisors were retracted enough that I could at last remove the bands and place an upper bite plate retainer.

This case had taken two years and nine months to treat. The bands had been on the mandibular teeth too long and had left some teeth marked with areas of decalcification and others with active gingival caries. The patient

looked much improved, but I am sure my friend was charitable to say it was a nice result. I felt that there must be a way, in these cases, to open the bite—temporarily if necessary, but to open it sufficiently to allow the maxillary incisors to be fully retracted in as short a time as possible. In other words, I wanted a method for retracting the anterior teeth while a deep overbite existed, and then the overbite could be corrected with the patient on retention.

It was after this experience that I started to look for an answer to this problem. In my search, I found such an answer in the lower bite raiser-upper bite plate technique that is described in this article.

## DEFINITION AND DESCRIPTION

*Lower Bite Raiser.*—For the purpose of this article, a lower bite raiser will be defined as an acrylic lower splint, which is illustrated in Fig. 1.

This lower bite raiser presents no difficulties in construction, but several variations from the normal lower retainer should be mentioned.

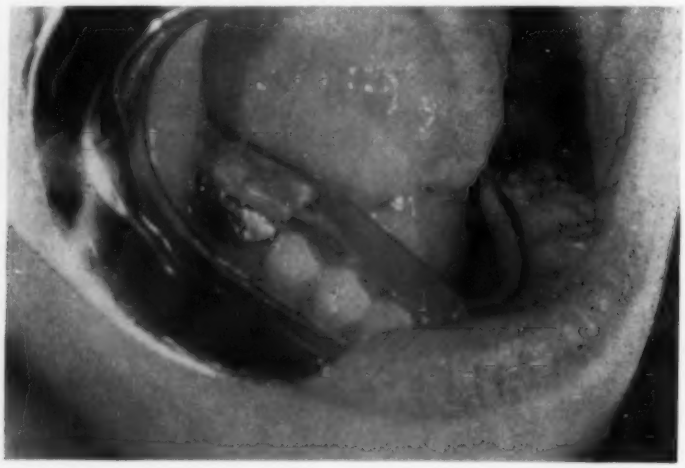

Fig. 1.

It has been my custom in the past to have an .036 stainless steel lingual wire buried in the acrylic of all conventional lower retainers. This wire runs from molar to molar, and at the lingual groove of each molar rises out of the acrylic and is adapted over the lingual groove onto the occlusal surface of the molars. This serves a double purpose. The retainer is stronger, and is "tooth borne" at this area of greatest masticatory pressure. This wire is incorporated into the lower bite raiser in order to provide the above advantages when the bite raiser is later cut down into a regular lower retainer.

The height of the platform portion of this device is determined by mounting the casts on a simple articulator. The platform must be thick enough to open the bite sufficiently that it is possible to fully retract the maxillary incisors with no interference from the mandibular incisors. The length of the platform portion is constant in all cases and extends from the mesial "surface" of the cuspid to the distal "surface" of the molar. In the anterior region, the acrylic appears only on the lingual surfaces of the teeth and the soft tissue.

The acrylic in the buccal segments must be carried across the occlusal and onto the buccal surfaces of the teeth, especially the first molars. The reason for this emphasis of a seemingly unimportant point is the greatly increased lower stability obtained against the traction of intermaxillary elastics. I almost invariably have the patient wear intermaxillary elastics from these mandibular molars during the retraction of the maxillary teeth. Without the acrylic on the buccal surface, these molars could not be used for anchorage.

*The Upper Bite Plate.*—The upper bite plate has a platform to contact the mandibular incisors and, to make it tooth borne in this area, the acrylic is carried over the incisal surfaces onto the labial surfaces. Split 0.030 labial bows are often incorporated into the upper bite plate in case, at some future date, I wish to cut away the anterior platform portion entirely, thus leaving a standard Hawley type retainer.

## SELECTION OF CASES

The selection of cases has been rather simple, as the only cases treated by this method are those where the normal methods for reducing the overbite have not been successful.

In my office I have found this method of great value in neutroclusion and distoclusion cases, both in extraction and nonextraction cases.

In the cases where this method was used, I have always carried the treatment along to the stage where the following conditions are present:

1. The mandibular arch is flat and is in a proper arch form.
2. The molars, premolars, and cuspids are in neutroclusion.
3. The maxillary incisors are spaced and protrusive.
4. The mandibular incisors, by contacting the lingual surfaces of the maxillary incisors, prevent their full retraction, and so make it extremely difficult for the case to be completed in a reasonable time. It is at this point in any of these cases that the lower bite raiser–upper bite plate technique has been of great value to me.

## MECHANICS

The explanation of the mechanics of this technique may best be presented by a detailed history of a case in which it was employed. The preliminary work done for case analysis included making gnathostatic casts, a full-mouth roentgenographic survey, gnathostatic photographs, and the tabulation of the information contained in an examination chart. This showed that the girl had an extreme distoclusion, with an overbite of 7 mm. and an overjet of 14 mm.

In drawing up a treatment plan for this 11-year-old youngster, particular attention was paid to an accurate determination of the freeway space and the possible mandibular displacement. It is most important in the use of the lower bite raiser to upper bite raiser technique that, if possible, the bite is not opened enough to encroach upon the normal freeway space. In my office I rely on two well-established clinical methods for determining this freeway space and possible mandibular displacement. First, repeated observations of the man-

dible at the conclusion of a normal swallow are recorded. It has been noted that many children experience difficulty in keeping the mandible at rest at the conclusion of a swallow, so the freeway space and mandibular position are always double checked by having the patient say, "M-m-m-m," and gradually trail off the sound until the mandible comes to rest. I have had more consistent results with this latter method, particularly with younger children. If cephalometric headplates are available, a further check is possible.

It was decided that no extractions were indicated, that a favorable mandibular displacement was possible, and that the chief problem in treatment would be the deep overbite. There was a freeway space of 2 mm. in the molar area, and the mandible at rest was 2.5 mm. anterior to its position in occlusion. The absence of the mandibular third molars further contraindicated any reduction of tooth structure in this mouth. It might be added here that, in this particular type of case, if good third molars, favorably positioned, are present I frequently remove maxillary second molars prior to using intermaxillary elastics. The removal of premolars was deemed inadvisable because, first, it would tend to increase the overbite problem and, second, after careful measurement it was decided that the full complement of teeth could be retained. When this girl is about 20 years of age I will have the upper third molars removed, but feel it is inadvisable to have this done at such an early age.

Regarding the expected anterior repositioning of the mandible, I felt that the case was starting with a 2.5 mm. posterior mandibular displacement, and thought it reasonable to assume this would correct itself as the cuspal interferences were eliminated during treatment. Finally, the limited freeway space suggested that the adjustment of the overbite would present the greatest difficulty in establishing a functional occlusion.

Briefly the treatment plan decided upon was this:

1. An upper bite plate, that would free the cuspal contact, would be used.

2. Simultaneously, the distal movement of the maxillary permanent molars by the use of light intermaxillary elastics from the mandibular first permanent molars to the upper buccal bars. Lower arch stability was obtained from a close-fitting .036 lingual arch wire extending from first molar to first molar.

3. Later it was planned to complete the retraction of the upper incisors and to finish the case with a multibanded appliance.

This plan was instituted, using the bite plate and intermaxillary elastics, which gave a traction of 1.5 ounces on each side. At the end of five months the mandibular replacement had occurred, and the bite had opened sufficiently that it was decided to discontinue the use of the bite plate. Intermaxillary elastics were continued to the buccal bars for a further six-month period, at the end of which it was evident that the bite was closing again despite the distal movement of the molars and the forward mandibular replacement. After twelve months of treatment, the maxillary first molars were in neutro-

clusion and the premolars and cuspids were banded and moved distally by the same light intermaxillary pressures until, after five more months of treatment, the buccal teeth were in neutroclusion. At this time all the mandibular teeth were banded, the curve of Spee was flattened, and arch form was achieved.

The next step in the treatment plan called for the banding and retraction of the upper anterior teeth. This was done, but it soon became evident that their full retraction was impossible because of the overbite. The mandibular incisors were contacting the maxillary incisors which were still, unfortunately, spaced and protrusive. At this point the lower bite raiser was indicated.

Following are the detailed steps in its placement:

1. The mandibular bands were all removed.

2. Radiograms were made to check for caries.

3. The lingual sheaths were cut off the mandibular first molar bands, and they were immediately recemented.

4. An elastic impression was taken of the mandibular arch with the molar bands cemented in place.

Fig. 2.

5. A bite raiser was constructed to open the bite sufficiently to permit the full retraction of the maxillary incisors.

6. On the following day, the bite raiser was placed and intermaxillary elastics were worn from the mandibular first molars to the maxillary cuspids. It was now possible to retract the maxillary incisors and this was completed in the following four months (Fig. 2).

At this point the switch-over to the upper bite plate was indicated and the following are the detailed steps in its placement:

1. The maxillary bands were all removed.

2. Radiograms were taken to check for caries.

3. An elastic impression of the maxillary arch was taken with no bands in place.

4. A wax bite was taken with the lower bite raiser out.

5. The mandibular molar bands were removed and the lower bite raiser was replaced. The patient was warned to leave the lower bite raiser in her mouth until the upper bite plate was placed. This is most important because at this stage the teeth, in occlusion, are contacting in the incisor region only and an almost immediate relapse would occur if the lower bite raiser were left out before the upper bite plate was placed.

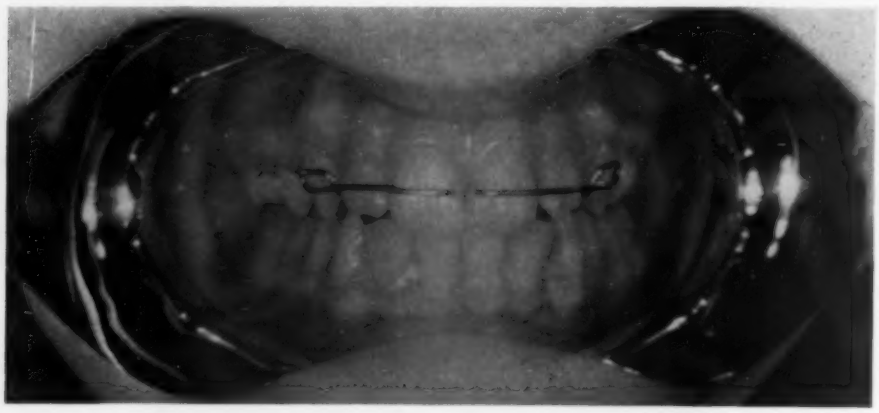

Fig. 3.

6. On the following day the upper bite plate was inserted (Fig. 3) and at this time the platform portion of the lower bite raiser was cut down about 1 mm. to allow the maxillary posterior teeth to exfoliate. It was now necessary to see the patient about every two months to gradually cut down and, finally, cut away the posterior platform of the lower bite raiser as the bite opened. Generally in these cases, as soon as the bite is opened to the correct position, I prescribe wearing the plate at night only, but for a longer period than in nonoverbite cases.

## CONSTRUCTION DETAILS

The construction details are very simple, so I will mention only a few important steps. The laboratory technician uses only a simple articulator. After he has waxed up the lower bite raiser or upper bite plate, the orthodontist checks it. In the placement of either the lower or upper bite plate, articulating paper is used to check the bite, to make certain that the occlusal stress is taken evenly on the desired teeth.

## SECONDARY ADVANTAGES

### *Advantages*

1. This technique provides a simple and practical method for concluding difficult deep overbite cases.

2. All bands, particularly the lowers, are on the teeth for a shorter period of time than they would be if this method were not used.

3. The lower bite raiser can be used for intermaxillary traction at any time and it gives excellent mandibular anchorage.

4. The lower bite raiser eliminates cuspal interference during intermaxillary traction, and therefore greatly aids in the distal movement of the maxillary posterior teeth.

5. The appliances are easily maintained, and only minor adjustments are needed at each visit.

6. It is economical in time and expense because the lower bite raiser and upper bite plate can be cut down into standard retainers after their original purpose has been served.

7. It shortens the length of time a patient is under active treatment.

8. Patient cooperation is good because the appliance is: (a) inconspicuous and (b) considered by most patients an aid to mastication after the first few days.

9. The lower bite raiser is of tremendous advantage in reducing an anterior cross-bite in pseudo-mesioclusions or in a pseudo-unilateral cross-bite.

### *Disadvantages*

1. Cleanliness. It is imperative that every patient be strongly impressed with the importance of maintaining cleanliness of these plates.

2. The lower arch stability is under the patient's control during the use of intermaxillary elastics.

3. The acrylic appliances are removable and are subject, therefore, to loss or breakage through carelessness.

## CONCLUSION

This method of handling selected deep overbite cases has proved effective, at least in my hands, and since starting its use I have had greater success, with less time and effort required from myself or the patient.

## SUMMARY

1. This article presents a method for completing some difficult deep overbite cases.

2. The selection of cases reduces itself to the following situation, whether acquired by nature or by preliminary orthodontic treatment: (a) buccal segments in neutroclusion, (b) maxillary incisors spaced and protrusive, (c) mandibular incisors striking the lingual surfaces of the maxillary incisors, and (d) mandibular curve of Spee flattened.

3. The mechanics of this method was described by fully explaining its use in the treatment of a typical case.

4. The construction details were outlined.

5. Advantages and disadvantages were discussed.

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## Abstracts Presented Before the Research Section of the American Association of Orthodontists, Chicago, May 19, 1954

**A Roentgenographic Investigation of the Effect of Orthodontic Treatment on the Relationship of the Alveolar Bone Proper to the Cementoenamel Junction**: By Donald H. Baxter, D.D.S., M.S., University of Washington, Seattle, Wash.

*Purpose:* To determine the effect of orthodontic tooth movement upon the height of the alveolar bone proper at the alveolar crest.

*Material and Method:* Before and after treatment, intraoral Bite-wing roentgenographs were studied from sixty-three completed orthodontic cases in which the edgewise appliances were used. Measurement was made from the cementoenamel junction to the most occlusal and adjacent part of the alveolar bone proper (to be referred to as Point Z). The difference in this measurement between before- and after-treatment indicated the amount of bone change at Point Z. The eight areas measured included the distal of the canine to the mesial of the twelve year molar in the four quadrants of the mouth.

*Conclusions From Statistical Analysis:*

1. When bone areas of all the cases were considered together, there was less than 0.5 mm. mean alveolar bone loss at Point Z.

2. When the cases were divided as to extraction and nonextraction, there was no significant difference in alveolar bone loss.

3. In first premolar extraction cases, comparison was made between bone areas adjacent to extractions (that is, distal of canines and mesial of second premolars) and areas where no extraction had occurred. There was no significant difference in alveolar bone loss. In no case was there indication of any so-called "pocket formation."

4. When bone areas in which teeth were extruded during treatment were compared with bone areas in which no extrusion occurred, there was no significant difference in the amount of alveolar bone change.

Thus, alveolar bone proper at Point Z adapts considerably to orthodontic tooth movement and a constant relationship is maintained between the alveolar bone proper and the cementoenamel junction.

**The Development of the Squamoso-Mandibular Articulation in the Rat From 16 Days Insemination Age to 30 Days After Birth**: By John J. Cunat, D.D.S., M.S., University of Illinois, Chicago, Ill.

This study is based on a histologic investigation of complete serial frontal sections through the squamoso-mandibular articulation of sixty-one rats ranging in age from 16 days insemination age to 30 days after birth.

At 17 days insemination age, the condylar and angular cartilages proliferate posteriorly from a single cartilaginous sheet. The posterior end of the condylar cartilage is separated from the squamosal bone and its zygomatic process by highly cellular mesenchyme in which a slit appears at 19 days insemination age. At 20 days insemination age, a second slit is seen superolateral to the condylar cartilage. The fusiform cells that lie between the slits are the anlage of the interarticular disc and the slits represent the two synovial cavities. By 21 days insemination age, the disc can be seen to be continuous laterally with a mesenchymal band which is the anlage of the capsular ligament, and medially with the connective tissue around the fibers of the external pterygoid muscle. With age, both the capsule and the disc become thicker and more fibrous.

The condyle proliferates posteriorly until the fourth day after birth, when it changes to a superolateral path. At first, it is a solid rod of cartilage, but it becomes progressively destroyed and replaced by bone, leaving only a thin cartilaginous cap. The perichondrial splint that surrounds the condylar cartilage is club-shaped until the fifteenth day, when modeling resorption begins on its medial and lateral surfaces. Resorption continues until, at 30 days, the condylar process consists of a bony neck surmounted by a mushroom-shaped condylar cartilage.

**A Radiographic Investigation of Various Movements of the Mandible**: By Elizabeth J. Zwemer, D.D.S., M.S.D., Northwestern University, Chicago, Ill.

It was the purpose of this investigation to demonstrate whether the position of the mandibular condyle in the fossa with the teeth in occlusion is coincident with a retruded mandibular position and an 8 mm. splint-opening retruded position, or if these are separate and distinct condylar positions.

Nine persons from Northwestern University Dental School, possessing excellent occlusion of the teeth and presenting with no symptoms of abnormal function of the temporomandibular joint, were selected to participate in the investigation. In these cases it was assumed that, with the teeth in median or neutral occlusion, the condyles were in their natural positions in the articular fossae.

Temporomandibular and cephalometric radiographs were taken of each subject with the mandible in the positions of rest, occlusion, working side, nonworking side, and retrusion, with and without an 8 mm. acrylic block cemented over the anterior teeth. Composite tracings were made from the radiographic images to compare the kind (rotatory or translatory), direction, and amount of condylar movement demonstrated.

The following observations were made:

1. When movement was observable from rest to occlusion, it was a pure or almost pure rotatory movement with the center of rotation in the neck of the condylar process.

2. Occlusion, retrusion, and 8 mm. splint-opening retrusion were separate and distinct positions in the majority of cases studied.

3. Retrusion is possible from the occlusal position.

4. This retrusive range apparently is used on the masticating side in function.

5. Due to the difference in angulation of the x-rays to the condylar process with the head positioned in the cephalometric and temporomandibular

joint device, a direct comparison as to the position of the condyle is not possible in every case. Each method should be compared within itself rather than with other methods.

**A Study of the Dentofacial Anatomy in Normal and Abnormal Individuals Employing Lateral Cephalometric Radiography**: By H. Jenkins, B.D.Sc., D.D.S., University of Toronto, Toronto, Ontario.

*Method.*—This study employed four samples: one normal adult sample of twenty-six, one normal child sample of thirty-two, one Class II, Division 1 child sample of thirty-two, and one Class III child sample of ten individuals.

The skull was viewed as three functional areas: the cranium or brain case, the jaws and teeth, and the orbital nasopharyngeal area.

Two functional planes representing the base of the skull (Bolton plane) and the occlusal plane were drawn.

Morphologic variation in the skull deriving from two sources was then studied. The sources were (a) variation between cranial and masticatory functional systems, measured by the cranial base occlusal angle, and, (b) variation within functional systems. (This was measured in the masticatory system with occlusal plane as the reference plane.)

Since the occlusal plane cannot be reliably established in many types of malocclusion, a theoretical occlusal plane or line of occlusion was derived from bony measurements based on the orientation of the jaws to each other.

To study ventrodorsal jaw relations, the position of "B" (Downs) point and gnathion was measured in relation to a plane drawn through "A" (Downs) point at right angles to occlusal plane.

*Findings.*—1. Normal and abnormal individuals in the four samples exhibit similar craniofacial morphology in the characteristics studied, except for variation in chin position and certain dental relations. However, abnormal samples tend to display greater ranges of values.

2. The normal child and adult samples are very similar except for a more forward position of the bony chin to the degree of 1.5 mm. in adults.

3. "B" point and gnathion normally exhibit similar values for their position with respect to "A" plane. Normal individuals exhibit a certain range of values for gnathion (6 mm.) and "B" point (4.5 mm.) about the mean position (child, 1.5 mm. and adult, 3 mm.) with respect to "A" plane.

4. The chin is situated posteriorly to normal in Class II, Division 1 cases (6 mm.) and anteriorly in Class III cases (8 mm.). However, 50 per cent of the Class II, Division 1 sample exhibit a chin position within the normal range. In these cases the mandibular deformity is of the nature of a dentoalveolar retraction.

5. The first permanent molars are similarly placed equidistant from "A" and "B" point in each jaw in normal occlusions, if measured along the occlusal plane, with a range of 3 mm. The Class II, Division 1 maxillary molar is 2 mm. postnormal in the maxilla. Class III cases exhibit a mandibular molar position, which, although abnormally anterior in relation to the maxilla, is actually more posterior to "B" point than normal. An explanation of these molar positions is suggested.

6. Downs values for incisor inclination are unacceptable for the Toronto populace.

7. Previous findings were confirmed by superimposition of tracings to indicate that variation within the cranial and masticatory functional systems was minor compared with the variation between these systems, as measured by

the cranial base occlusal angle (mean, 35; range, 25 to 45). A small cranial base occlusal angle tends to be found with a straight profile, square-jawed individual; a large angle is found with the convex type of profile. Since the major bony variation in the masticatory system lies in mandibular ventrodosal translation along occlusal plane, variation in the cranial base occlusal angle may have important connotations in defining (a) the direction of masticatory muscle pull on the mandible, (b) the individual growth pattern of the child, and (c) the esthetic prognosis inherent in a malocclusion case.

8. Models of the adult normal occlusions were traced by a surveying machine. The normal maxillary and mandibular dental arches exhibit high conformity in shape and dimensions. The maxillary arch is, on the average, 2 mm. wider than the mandibular arch. The maxillary arch width in the first premolar region is related to the canine fossa width.

**Prediction of the Facial Angle in Man**: By Leonard Frantz, D.D.S., University of Illinois, Chicago, Ill.

The lateral cephalometric roentgenograms of thirty-four Class I and thirty Class II, Division 1 adults were traced. Certain dimensions or variants were measured and an analysis of each individual was developed, based on the sample variation. The quantitative accuracy of each individual analysis was checked by attempting to predict the angle formed by the facial plane and the anterior cranial base. This angle depicts the degree of mandibular prognathism and was found to be strongly correlated to the sagittal occlusion. The prediction was based on the addition of certain variants.

The best method for the Class I sample was that which utilized the cranial base angle, the ramus inclination angle, and the proportion $\frac{\text{Go-Gn}}{\text{S-N}}$. The average accuracy of the individual prediction was 2.35 degrees.

The best method for the Class II, Division 1 sample was that which utilized the ramus inclination angle alone. The average accuracy of the individual prediction was 2.58 degrees. Addition of the proportion $\frac{\text{Go-Gn}}{\text{S-N}}$ and the cranial base angle yielded results that were almost as accurate.

Cases were noted in which the gonial angle was an aid in making the prediction and other cases were noted in which the cranial base angle was not.

**An Analysis of Tooth Size, Tooth Position, and Size of Supporting Area**: By Robert F. Taylor, B.S., D.D.S., University of Washington, Seattle, Wash.

This study was an effort to determine biometrically the simultaneous occurrence of various factors with tooth positions employing eighteen selected excellent occlusions and seventeen Class II, Division 1 malocclusions with crowding. It has served to test previous assumptions and provide theories for further clinical study.

Overjet and overbite in the excellent occlusion group bordered on a significant positive correlation with each other; but, when related with other factors, the results varied. Tooth size ratio of maxillary to mandibular teeth plus the first permanent molar relationship showed no relation with overbite, but bordered on a significant correlation with overjet. As the maxillary and mandibular incisors became less protrusive to each other, the overbite increased. The linear difference in points "A" and "B" (Downs) were poorly related to both overjet and overbite. The interocclusal clearance did not bear a significant relationship with overbite.

In cases of excellent occlusion, the inclination of the central incisors was highly correlated with a ratio of two times the distance from the mesial of the first permanent molar to the apex of the central (corrected to place this measurement in line with the posterior dental units) to the mesiodistal widths of all canines and premolars. Graphs and formulas were presented so that clinicians could test this relationship further.

In comparing crowded and noncrowded cases, the size of the anterior teeth appeared more important in crowding than the arch width at the canines.

The arch form of the excellent occlusions studied conformed to neither constructed Bonwill-Hawley diagrams or parabolic curves.

Measurements of supporting area bordered on a significant correlation with the size of the teeth. Further evidence seemed to discredit the "basal bone" theory, however, and give support to Angle's "line of occlusion." No constant relation of the apex of the central incisor could be found with the supporting area. The distal position of the apex of the maxillary central incisor from point "A" showed no relation with its inclination. In the mandibular arch, the corresponding correlation bordered on significance.

**Dental Changes Accompanying Treatment of Class II Malocclusions by Extraoral Means**: By Robert Warren Baker, D.D.S., University of Illinois, Chicago, Ill.

This investigation was based on a serial roentgenographic cephalometric study of forty-four children. The age range was from 7 to 13½ years of age. These cases were selected when they were in Class II, Division 1 relationship just before orthodontic intervention with maxillary extraoral anchorage. The first headplate was taken at this time. The second headplate was taken after the molars had been corrected to a Class I relationship by extraoral means.

The following measurements were made from the collected data:

1. Treatment time.
2. Distance from sella turcica to the maxillary first molars (bisected), along the palatal plane (anterior nasal spine—posterior nasal spine extended). This was done by dropping a perpendicular from sella turcica to the palatal plane and also constructing a perpendicular from the buccal groove of the bisected maxillary first molars to the palatal plane.
3. Gonion—gnathion.
4. Angle sella turcica—nasion—anterior nasal spine.
5. Distance from sella turcica to anterior nasal spine along the palatal plane.

These measurements were made on both the first and second sets of records and then put in tabular form, the final figures representing the differences between the two measurements. Scatter diagrams were then constructed to determine whether or not trending was present and, finally, statistical methods of evaluation were employed to see if these figures were actually related and if a correlation was present.

It was found, comparing the measurement sella turcica—maxillary molars to the measurement sella turcica—anterior nasal spine, that a high correlation existed. The degree of reliability was to the 0.1 per cent level, which is very significant. Also, sella turcica—maxillary molars compared to the angular reading sella turcica—nasion—anterior nasal spine gave a degree of reliability which was to the 0.1 per cent level also. Sella turcica—treatment time gave

a significant degree of reliability, again to the 0.1 per cent level. These high degrees of reliability were all of the same sign; thus, the two variables tend to vary in the same direction.

By this high correlation, it is understood how tooth movement is correlated with growth and how we may expect rapidly growing cases to behave in a fashion much different than slow growing cases. In the slow growing case we find a definite posterior position of the molars in relation to sella turcica from the first headplate to the second examination, thus showing an actual posterior movement of the teeth, while in the rapidly growing cases we find the same measurement has increased and the molars are in a more anterior position to the selected fixed skeletal point.

**A Cinefluorographic Evaluation of the Results of Orthodontic Treatment of Class II, Division 1 Malocclusions Which Previously Exhibited Posterior Translation of the Mandible and a Study of the Spatial Relationship of the Hyoid Bone**: By John V. Drake, D.D.S., M.S., University of Washington Dental School, Seattle, Wash.

This study is an evaluation of Class II, Division 1 malocclusions which exhibited posterior translation of the mandible from rest position to full occlusion before orthodontic treatment. The cinefluorographic technique was used so that the mandible could be observed in motion. Previous studies using the Broadbent-Bolton roentgenographic cephalometer have allowed the investigator to view only stationary positions. The spatial relationship of the hyoid bone was included in this study, since disagreement exists concerning the action of the suprahyoids as depressor muscles of the mandible.

Two Class II, Division 1 cases exhibiting posterior translation of the mandible were selected for this investigation. One Class II, Division 1 case showing normal mandibular movement was used as a control. An animated movie sequence and tracings were made from cinefluorographic films to compare the functional path of the mandible before and after orthodontic treatment. Oriented lateral headfilms were used to supplement these findings.

Eighteen cases were selected at random to study the spatial relationship of the hyoid bone during opening movements of the mandible. Cinefluorographic films were taken and traced.

The analysis of the findings leads to the following conclusions:

1. The posterior translation of the mandible exhibited by the Class II, Division 1 malocclusions was corrected by orthodontic treatment.

2. In both cases, this correction of the posterior translation of the mandible was caused by a posterior repositioning of the rest condylar position, and the occlusal condylar relationship remained the same.

3. These cases appear to have an anterior displacement of rest position, rather than a posterior displacement of the mandible.

4. The hyoid bone is not in a position, during the normal opening movements of the mandible, to allow the suprahyoid muscles to act as depressor muscles of the mandible.

**A Correlative Study of Palatofacial Growth Using the Cephalometric and Roentgenographic Cephalometric Techniques (Read by Title)**: By Alvaro C. Henriques, University of Pennsylvania, Philadelphia, Pa.

Palatofacial growth and the relative merits of cephalometry and roentgenographic cephalometry as tools in its study are the subject of this investigation.

The study is based on 388 children of both sexes, aged 9 to 14 years, from the Philadelphia public school system. The selection of these children was based on good health history, an average middle-class socioeconomic status, and diversity of ethnic background of the Philadelphia population.

The method followed in this study consisted of direct measurement on the living and cephalometric x-rays. The facial measurements (extra-oral) comprised three depth measurements (porion-subnasale, porion-prosthion, and porion-intradentale superum labiale) and two breadth measurements (bicondylar and bizygomatic), as well as their roentgenographic counterparts. The intraoral measurements comprised two depth measurements (palate length and arch length) and seven breadth measurements (bicanine width, two bipremolar widths, and four bimolar widths).

All the data have been reduced and analyzed from three aspects: (1) chronological age, (2) dental age, and (3) skeletal age. For a detailed analysis of the data, it was necessary to draw up tables of distribution of normal occlusion and malocclusion in each of the above categories. The classification used was that followed by Dewey and Anderson in their *Practical Orthodontics.*

The analysis of the extraoral dimensions reveals the following:

A. The behavior of depths is different from that of breadths.

B. When cephalometric and x-ray dimensions are compared, the differences are not uniformly clear-cut as far as depths are concerned. In breadth dimensions, however, we see marked differences between cephalometric and x-ray measurements and a clearer pattern that varies only with sex.

C. The postnatal growth potential in facial depths is greater than in breadths. Therefore, the skeletal age is probably a more important factor, especially because the growth rates according to chronological age and skeletal age seem to be related to each other.

D. In facial breadths there are less differences between chronological age, dental age, and skeletal age.

When maturation and tooth eruption keep pace with each other, it is safe to expect that the faciodental complex will develop into a normal occlusion; malocclusion may result otherwise.

A. The analysis of skeletal age tables shows that a more advanced individual has a dimensional advantage over the average maturer, whereas a skeletally retarded child has a dimensional disadvantage.

B. While the differences in the mean values of the dimensions, as between skeletally retarded, average, or advanced, may not be statistically significant, we feel that there is an advantage in the advanced group. This is, of course, based on the assumption that increased size, in bony structure, is generally a desirable factor in orthodontic treatment.

Cephalometric measurements are sufficiently dependable for routine analysis in orthodontic practice. They follow the same proportional and growth patterns as x-ray measurements. The differences that may exist between them, either due to magnification in the x-ray pictures of the position of bony and cartilaginous porion, do not influence the fact that they are both a measure of forward and downward growth of the nasomaxillary complex.

The analysis of the growth trend of palate length leads us to believe that the growth of this dimension terminates at the age of 13 in girls. However, in boys there is a residual growth potential that manifests itself beyond the age range of our sample.

There are little or no changes in arch length. This corroborates the findings in our previous study: that there is no growth anterior to the first premanent molar once this tooth has fully erupted.

The bicanine breadth increases from 9 to 12 years in boys and 9 to 11 in girls. Maturation has an influence on this dimension, that is, the more advanced the maturation, the greater this dimension.

The $Pm_1$-$Pm_1$ breadth increases in boys up to 11 years, whereas in girls it remains unchanged.

The bimolar breadth grows in boys until the age of 14 years (and probably later); in girls it ceases at 13 years.

Maturation is sine qua non in the development of these dimensions. The more advanced the maturation, the less the chances of occurrence of malocclusion due to a more adequate bony foundation. We cannot lose sight of the fact that habit (which is, in a sense, static and nonbiologic, as opposed to the dynamics of growth) may be a factor. If there were habit cases in our sample, then obviously the comparison between "retarded" and "advanced" cases would be less meaningful. We have considered this factor carefully. The inclusion of a few such cases in our sample did not vitiate our findings. In a test run of our entire series we found just as many "habit cases" in our normal sample as in our malocclueded sample. In other words, we feel that habit, per se, is not demonstrably a factor in the usual case of malocclusion. The same rationale, we believe, applies to "early loss" cases, though here, of course, the dynamics of growth (but *not* of maturation) are more definitely involved.

Wherever we come across a malocclusion in an acceptably mature child, it is safe to presume the existence of maturational lag during the critical phases of development of the dento-occlusal complex. This presupposes a time link between bone mass and tooth eruption.

A knowledge of maturation level can be of great importance to the clinician in treatment planning. In general, we feel that a child who is a maturational "laggard" is one in whom the treatment could be deferred until skeletal age has caught up with chronological age. This would give the child a measure of bone growth (bone dimension) that will better enable a proper evaluation between tooth size and bone mass. It does not follow, however, that maturational lag is always associated with an eventually poor prognosis. Our knowledge and interpretation do not go that far.

# News and Notes

## American Association of Orthodontists

The following is a preview list of the distinguished essayists and clinicians to be featured at the coming annual session of the American Association of Orthodontists to be held May 8 to 12, 1955, at the Fairmont Hotel, San Francisco, California.

| *Essayists* | *Limited Attendance Clinicians* |
|---|---|
| Spencer R. Atkinson | Albert Heimlich |
| Wendell L. Wylie | Charles Whitman |
| Robert B. Murray | Lyall O. Bishop |
| William W. Paden | Joseph Johnson |
| Eugene E. West | Charles Tweed |
| B. Holly Broadbent | B. F. Dewell |
| William B. Downs | Gordon Fitzgerald |
| J. A. Salzmann | C. W. Carey |
| Charles A. Tweed | |
| Stephen C. Hopkins | |
| T. M. Graber | |
| Ram Sarup Nanda | |
| Herbert K. Cooper | |
| Wayne B. Slaughter | |
| K. F. Terwilliger | |
| Harold Westlake | |

*Attention Members:*

A limited attendance course in the Johnson twin arch orthodontic appliance will be given by Dr. Joseph E. Johnson of Louisville, Kentucky, at the College of Physicians and Surgeons in San Francisco, California.

It will include orthodontic diagnosis, twin wire appliance construction, and the manipulation of the appliance. It will be held May 2 through May 7, 1955, preceding the American Association of Orthodontists meeting in San Francisco, and is open to members or eligible members of the A.A.O.

For further information and applications, write to Dr. T. N. Engdahl, Jr., 602 Medico-Dental Bldg., San Jose, California.

All nonmembers wishing to attend must write to the Chairman of the Credentials Committee at least thirty days before the session. The Chairman of the Credentials Committee is Dr. R. M. Curtner, 450 Sutter St., San Francisco, California.

## American Association of Orthodontists, 1955 Research Section Meeting

Continuing the policy of recent years, the program will consist of a series of ten-minute research reports which may be presented orally or read by title only. All persons engaged in research are urged to participate in this program which will be held Wednesday afternoon, May 11, 1955, in the Fairmont Hotel, San Francisco, California.

Each participant is asked to prepare a 250-word abstract for publication in the AMERICAN JOURNAL OF ORTHODONTICS. Abstract for publication and the ten-minute oral presentation at the meeting should be carefully prepared to present an adequate description of the import of your investigation.

Forms for use in submitting the title and 250-word abstract of your research will be sent to each dental school orthodontic department and to any individual requesting one.

Please send your title and abstract as early as possible, but not later than March 10, 1955, to Dr. Thomas D. Speidel, University of Minnesota, School of Dentistry, Minneapolis 14, Minnesota.

J. A. Salzmann, Chairman
Research Committee
American Association of Orthodontists
654 Madison Ave.
New York 21, N. Y.

## 1955 Prize Essay Contest, American Association of Orthodontists

*Eligibility.*—Any member of the American Association of Orthodontists and any person affiliated with a recognized institution in the field of dentistry as a teacher, researcher, undergraduate, or graduate student shall be eligible to enter the competition.

*Character of Essay.*—Each essay submitted must represent an original investigation and contain some new significant material of value to the art of science of orthodontics.

*Prize.*—A cash prize of $500.00 is offered for the essay judged to be the winner. The committee, however, reserves the right to omit the award if, in its judgment, none of the entries is considered to be worthy. Honorable mention will be awarded to those authors taking second and third places. The first three papers will become the property of the American Association of Orthodontists and will be published. All other essays will be returned.

*Specifications.*—All essays must be in English, typewritten on 8½ by 11 inch white paper, double spaced with at least 1 inch margins. Each sheet must be numbered and bound or assembled with paper fasteners in a "brief cover" so that they may be handled easily. Three complete copies of each essay, including all illustrations, tables, and bibliography must be submitted. The name and address of the author must not appear in the essay. For purpose of identification, the author's name, together with a brief biographical sketch which sets forth his or her dental and/or orthodontic training, present activity, and status (practitioner, teacher, student, research worker, etc.) should be typed on a seperate sheet of paper and enclosed in a sealed envelope. The envelope should carry the title of the essay.

*Presentation.*—The author of the winning essay will be invited to present it at the meeting of the American Association of Orthodontists to be held at the Fairmont Hotel, San Francisco, California, the week of May 9, 1955.

*Judges.*—The entries will be judged by the Research Committee of the American Association of Orthodontists.

*Final Submission Date.*—No essay will be considered for this competition unless received in triplicate at the following address on or before Feb. 15, 1955: Dr. Alton W. Moore, Medical Dental Building, Seattle, Washington.

J. A. Salzmann, Chairman, Research Committee
American Association of Orthodontists
654 Madison Ave.
New York 21, N. Y.

## Central Section of the American Association of Orthodontists

The annual meeting of the Central Section of the American Association of Orthodontists was held at St. Louis, Missouri, Oct. 3, 4, and 5, 1954.

The newly elected officers are:

President – – – – – – – – – – – – – – – – Howard Yost, Grand Island, Neb.
President-Elect – – – – – – – – – – – – – – Richard A. Smith, Evanston, Ill.
Vice-President – – – – – – – – – – – Thomas D. Speidel, Minneapolis, Minn.
Secretary-Treasurer – – – – – – – – – Frederick B. Lehman, Cedar Rapids, Iowa
Representative to the American Association of Orthodontists – Cecil J. Muller, Omaha, Neb.

Alternate - - - - - - - - - - - - - - - - - - Silas J. Kloehn, Appleton, Wis.
Sectional Editor of the AMERICAN JOURNAL OF ORTHODONTICS - Charles R. Baker, Evanston, Ill.
New member to Board of Censors - - - - - - - - Leo B. Lundergan, St. Louis, Mo.
New member to Publication Board - - - - - - - Kenneth E. Holland, Lincoln, Neb.
New member to Judicial Board - - - - - - - - - Earl C. Bean, St. Louis, Mo.

Action was taken to increase the dues of associate members sufficiently to cover the cost of the JOURNAL for these members.

The 1955 meeting will be held at the Savoy Hotel, Des Moines, Iowa, on Oct. 2, 3 and 4. James Hoffer of Des Moines will be the chairman of local and general arrangements.

## American Board of Orthodontics

The next meeting of The American Board of Orthodontics will be held at the Fairmont Hotel in San Francisco, California, May 3 through May 7, 1955. Orthodontists who desire to be certified by the Board may obtain application blanks from the secretary, Dr. C. Edward Martinek, 661 Fisher Bldg., Detroit 2, Michigan.

Applications for acceptance at the San Francisco meeting, leading to stipulation of examination requirement for the following year, must be filed before March 1, 1955. To be eligible, an applicant must have been an active member of the American Association of Orthodontists for at least three years.

## Tufts College Dental School

The following orthodontic courses will be offered at Tufts College Dental School during the 1954-55 academic year.

DPG. 401—Orthodontics.
Each Wednesday for eight weeks from Feb. 9 to March 30, 1955.
Dr. Herbert Margolis and Staff.

DPG. 402—Cephalographics and Diagnosis.
Monday, Tuesday, and Wednesday, March 21, 22, 23, 1955.
Dr. Herbert Margolis and Staff.

## Northwestern University

On Feb. 21, 22, and 23, 1955, the Graduate Department of Orthodontics of Northwestern University Dental School will present a basic course in cephalometric radiography. The course is planned for orthodontists who have not had any previous training in cephalometric radiography.

For information, write to the Director of Post Graduate Study, Northwestern University Dental School, 311 E. Chicago Ave., Chicago 11, Illinois.

## University of Illinois College of Dentistry

On Feb. 6, 1955, the University of Illinois College of Dentistry presented a television course on "Occlusal Equilibration as an Aid in Orthodontics." This course was exclusively for members of the American Association of Orthodontists.

The program was as follows:

Natural Forces of Equilibration in the Human Denture. Allan G. Brodie.
Factors Contributing to Imbalance in the Human Denture. William Downs.
Basic Principles of Periodontal Tissue Response to Stresses. Isaac Schour.
Selective Grinding as an Aid in Occlusal Equilibration. A. C. Heimlich.

Occlusal Disharmonies as Diagnosis and Treatment—Television Presentation. John R. Thompson.

Television Demonstration on Mounted Casts of Technique for Complete Occlusal Equilibration in Orthodontically Treated Patients.

Television Demonstration on Patient of One Step in Equilibration Technique. A. C. Heimlich.

## University of Pittsburgh

The Graduate School of the University of Pittsburgh announces that selections of students for the graduate class in orthodontics will be made in March, 1955.

Further information and applications for admission may be obtained by writing to: The Director of Graduate Study, School of Dentistry, University of Pittsburgh, Pittsburgh 13, Pennsylvania.

## Thomas P. Hinman Mid-Winter Clinic

The forty-third session of the Thomas P. Hinman Mid-Winter Clinic will be held in the Municipal Auditorium in Atlanta, Georgia, March 20 through 23, 1955, under the auspices of the Fifth District Dental Society. Dr. Edwin C. Pound is chairman and Dr. Thad Morrison, Sr., is publicity chairman for the meeting.

Participants who have already confirmed their engagements include: Daniel F. Lynch, President of the American Dental Association, Washington, D. C.; Joseph L. Bernier (Pathology), Washington, D. C.; Ralph W. Ireland (Children's Dentistry), Lincoln, Nebraska; Gordon W. Johnston (Amalgam) Toronto, Canada; Carl R. Oman (Ultrasonic Cavity Preparation), New York, N. Y.; S. Howard Payne (Prosthodontics), Buffalo, New York; and LeRoy W. Peterson (Oral Surgery), St. Louis, Missouri. No field of modern dental science has been overlooked, and every subject will be represented by a well-known authority. All members of the profession in the Southeast are invited.

## American Association for Cleft Palate Rehabilitation

The American Association for Cleft Palate Rehabilitation will hold its annual meeting May 13 and 14, 1955, in Boston, Mass.

## Postgraduate Course in Labiolingual Technique

The annual postgraduate course in labiolingual technique was held at Washington University School of Dentistry, St. Louis, Missouri, Dec. 5 to 11, 1954.

The course was directed by Dr. Oren A. Oliver of Nashville, Tennessee, assisted by Dr. Boyd W. Tarpley of Birmingham, Alabama, Dr. Wm. H. Oliver of Nashville, Tennessee, and Dr. Harold K. Terry of Miami, Florida. Correlative lectures were given by the staff members of the Schools of Dentistry and Medicine of Washington University.

Orthodontists from eleven states were enrolled in the course.

## Northeastern Society of Orthodontists

The Northeastern Society of Orthodontists will hold its annual meeting March 7 and 8 at the Hotel Commodore in New York City. The program is as follows:

*Sunday, March 6*

Registration. West Ballroom foyer. 5:00 to 7:30 P.M.
Cocktail party. West Ballroom. 5:30 to 7:30 P.M.

*Monday, March 7*

Registration. Grand Ballroom foyer.
A Case Report—Autonomic Orthodontics. Edward I. Silver, Boston, Mass.
Limitations in Orthodontics. Thomas D. Speidel, Minneapolis, Minn.
Forces Governing Occlusion in Cleft Palate. Samuel Pruzansky, Bethesda, Md.
The Movement of Vital and Devitalized Teeth in the Macacus Rhesus Monkey. Robert J. Huettner, Bay Shore, Long Island, N. Y.

Luncheon. Grand Ballroom.

PRESIDENT'S ADDRESS. Philip E. Adams, Boston, Mass.

A SURVEY OF CURRENT PRACTICE PROCEDURES (Result of Poll Taken in 1953). Robert C. Germond, Jamestown, N. Y.

MEMORIAL RESOLUTION TO HARRY STRUSSER. Joseph D. Eby, New York, N. Y.

THE USE OF IMPROVED TISSUE-BORNE ANCHORAGE IN THE TREATMENT OF CASES OF EXTRACTION AND OLIGODONTIA VERA. Walter R. Bedell, Poughkeepsie, N. Y.

ENDOCRINE ASPECTS OF DENTAL MATURATION. Ralph E. Moloshok, New York, N. Y.

Executive Session. Grand Ballroom.

*Tuesday, March 8*

VARIATIONS OF LABIO-LINGUAL THERAPY IN CLASS II CASES. William L. Wilson, Boston, Mass.

PREDICTING ERUPTION SEQUENCES OF LATER CHILDHOOD. Thomas Speidel, Minneapolis, Minn.

A NEW IMPROVED METHOD OF TREATMENT OF IMPACTED OR UNERUPTED TEETH. Harold E. Leslie, Toronto, Canada.

NUTRITION IN RELATION TO BONE FORMATION. Donald Gribetz, Mount Sinai Hospital, New York.

Past President's Luncheon.

Executive Session.

AUDIO-VISUAL PROGRAM:

Equilibration of the Occlusion of Natural Dentition. Forty-two-minute movie with slides and discussion. Nathan Shore, New York, N. Y.

CLINICS:

A Unique and Efficient Method of Constructing Stainless Steel Molar Bands. William G. Houghton, Watertown, N. Y.

Clinic Supplementing Paper. William L. Wilson, Boston, Mass.

Clinic Supplementing Paper. Walter R. Bedell, Poughkeepsie, N. Y.

The Importance of Proper Band Placement. Robert C. Sturtevant, Jamaica, Long Island, N. Y.

The Linked Arch: A New and Clinically Tested Appliance. Joseph D. Berke, New York, N. Y.

Short-Term Orthodontic Therapy for Social Service Clinic Patients at Community Service Society of New York. Melvin Wallsheim, Brooklyn, N. Y., and Edward T. Pierce, Manhasset, Long Island, N. Y.

Technique Assists in Class II Malocclusions. Herbert Fine, Mt. Vernon, N. Y.

A Handful of Headgear Cases. Walter Spengeman, Yonkers, N. Y.

A Simplified Cephalometric Appraisal for Diagnosis. Moses A. Schwartz and Harold Eder, Bronx Hospital Orthodontic Staff.

Orthodontic Management of a Cleft Palate Case. Samuel H. Stein, Bronx Hospital Orthodontic Staff.

Adult Orthodontics. Clara Rapkin, Bronx Hospital Orthodontic Staff.

Twin Wire Appliances. Jerome Sorrel, George Newman, Jack Breuer, Columbia University postgraduate students.

Method of Obtaining Torque Using Round Wires in the Edgewise Technique. Henry S. Nahoun, New York, N. Y.

Clinic Supplementing Paper. Robert J. Huettner, Bay Shore, Long Island, N. Y.

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## Notes of Interest

Frederick R. Aldrich, D.M.D., takes pleasure in announcing that John E. Aldrich, D.D.S., is now associated with him, practice limited to orthodontics, at 327 East State St., Columbus, Ohio.

Paul W. Johnson, D.D.S., announces the opening of his office at 500 West 17th St., Santa Ana, California, practice limited to orthodontics exclusively.

Robert C. Sturtevant, D.D.S., announces the removal of his office to 86-68 Midland Parkway, Jamaica 32, New York, practice limited to orthdontics.

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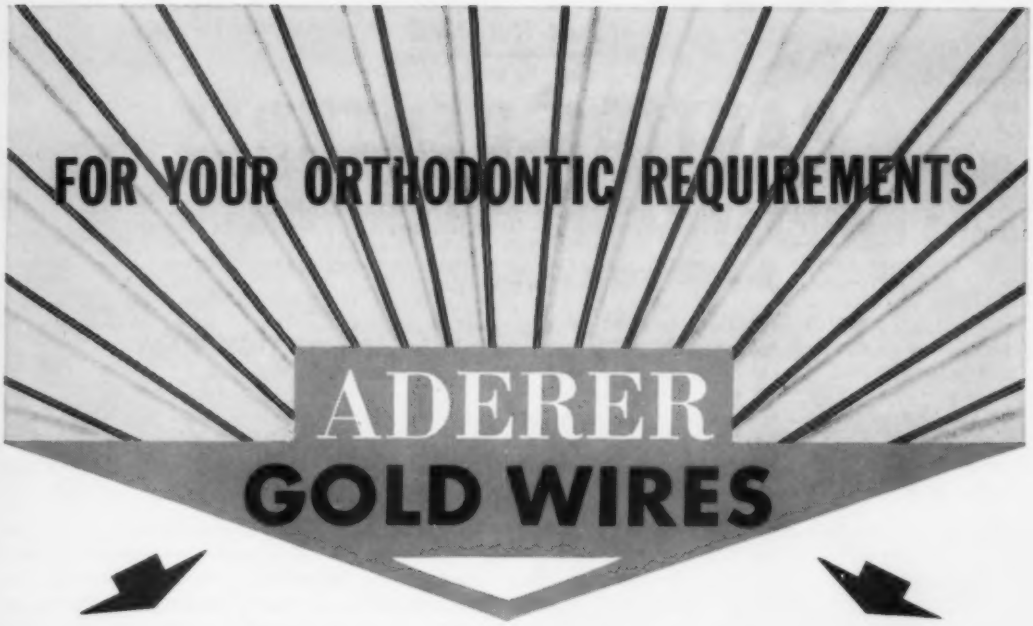


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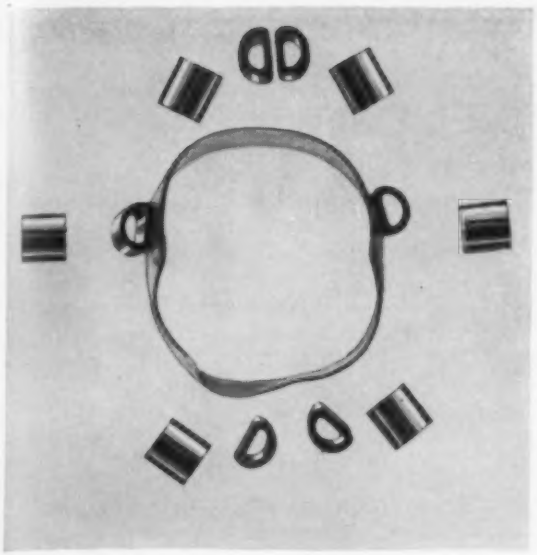

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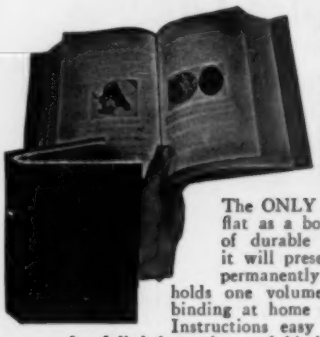

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